MOTION PICTURE PHOTOGRAPHY *for the* AMATEUR

Used as a Supplementary Text in New York Institute of Photography

Motion Picture Photography for the Amateur

By HERBERT C. McKAY

Used as a Supplementary Text in

NEW YORK INSTITUTE OF PHOTOGRAPHY

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A scene from the photo-drama "Bacchus" which was produced entirely by people, who, with the exception of the director and the cinematographer, had had no professional experience whatever.

PREFACE

I HAVE tried to point out the path for the beginner in cinematography. I have purposely avoided going into complex technical detail, and for this reason I beg my critics to be lenient, and to refrain from judging this work by professional standards. I have tried to keep in mind the fact that an amateur well started usually ends far above him who is thrown bodily into the mazes of any expert work without preparation.

The optical and chemical laws governing cinematography are those which govern still photography, but the mechanics are far different. If I have succeeded in arousing an interest in cinematography of a higher order than mere crank turning, I shall feel that my inadequate efforts have been highly successful. I do not pretend to be a veteran master cinematographer. In fact, the field extends before me with endless unexplored paths. If any of my readers choose to question any part of this work, I shall be glad to hear of it, for it will show me that there is an enthusiastic amateur gained and I may learn something of value.

This work has been a source of pleasure to me; for it recalls vividly my own first steps in cinematography, in that hard mill where the assistant carries the slate and learns his art by watching his chief for a period of three to five years, and it is with a real regret that I prepare to remove this last sheet and set my type-

writer away for a well-earned vacation. Should this work meet with your approval, I hope that at some future time, we may meet again through the medium of the printed page.

HERBERT C. MCKAY

INTRODUCTION

ONE of the most fascinating branches of photography, cinematography, has long been closed to the amateur because of the bulky and expensive equipment necessary for the production of motion pictures. A professional motion-picture camera costs almost any amount one cares to pay, from one thousand dollars up; the minimum operating equipment of the Bell & Howell standard motion picture camera, the camera most widely used in the large studios, costs a trifle more than two thousand dollars, but the actual equipment as used by the expert cameraman, ready for all emergencies, will usually represent an expenditure of from four to five thousand dollars. To this is added the great film expense. The negative costs four cents a foot for stock, plus a development charge of from one cent a foot up. Positive stock costs two cents per foot, but this cost is usually included in the laboratory charge of four and one-half to five cents per foot for furnishing a print complete. A conservative estimate of the actual cost of film stock and development is nine cents a foot for the first print. Finally, there is not to my knowledge any really satisfactory projector of standard gauge which can be purchased for less than two hundred dollars, and film without the projector is valueless. Thus the cost of the professional camera with a projector will run approximately twelve hundred dollars, and each new reel of film will cost at the very least

ninety dollars, and has a projection time of sixteen minutes. Thus, the production of motion-pictures has heretofore been largely limited to commercial production of one kind or another, or to those few fortunate amateurs who could command unlimited means. Six dollars a minute is rather heavy operating expense. However, this state of affairs no longer exists and entirely practical motion-pictures are now available to the amateur at a cost within reason. The various forms of apparatus used in making motion pictures will be discussed later.

Owing to the peculiar circumstances attendant upon the development of the motion picture industry, and the research along amateur lines this field has, one might almost say, opened to the amateur overnight. In still photography the amateur grew with the ever widening field of discovery and research in photography. He learned slowly and as each new improvement was brought forth, it was mastered with ease, for it represented but a detail, but in the field of motion-pictures the amateur has placed before him highly developed and delicate apparatus with which he is absolutely unfamiliar. The beautifully constructed cameras are designed after the high grade professional instruments, and instead of a long period of painful experimentation, the amateur has the field ready made presented to him. This means that he must grasp the results of years of experiment in a few days, and it is with the idea of giving a helping hand to such that I have drawn upon my experience as a professional cinematographer in writing this little volume. I hope that my understanding of the spirit of the modern

amateur in photography will help me to eliminate those points which, although of vital interest to the professional, would only confuse the amateur. Therefore, I shall expect a storm of adverse criticism upon my chapters dealing with acting, direction, cutting, titles and so forth, but kindly bear in mind that this work is not intended for the professional, nor for studio-use, but purely to point out the right road for the amateur, and the whole subject is approached from his point of view —which eternally diverges from that of his professional brother. Some day I hope that cinematography will be as deeply indebted to the amateur as is the still photography of to-day.

I shall include certain matter which is intended to be more informative than practical, such as the description of the highly perfected professional equipment, and the *modus operandi* of trick-work. Although few of my readers will have occasion to use this knowledge, I realize that the curiosity of the amateur is responsible for a great amount of the advancement of photography in days past, so if I pass over the boundary into the strictly professional field, it is only for this reason.

I also realize that although commercial industry is regulated by laws and rules which make for efficiency, the amateur is not to be driven, so I offer no hard-and-fast rules, but merely endeavor to point out the proper path, leaving the intelligent amateur to make his way along it in the manner best suited to his own ideas.

Chapter I.

CINEMATOGRAPHY

THE motion-picture, as such, does not exist, but owing to a certain deficiency in our optical organs an illusion of pictures in motion is easily made possible. This deficiency results in a peculiar physiological reaction known as "Persistence of Vision." The sensation which we call "Sight" is the result of light rays of various degrees of size and intensity impinging upon the sensitive retina of the eye. It is believed by modern science that these waves strike the retina with an actual physical impact. However that may be, it is well known that the effect is not instantaneous, but persists for a certain minute period of time. Thus, when we look at a rapidly moving object, we see it indistinctly, though for this to be apparent the motion must be very rapid, as we are accustomed unconsciously to compensate for the deficiencies of our vision and believe that we see many things which we do not see at all. This point will be discussed later, for it is of vital consequence in motion picture drama. Persistence of vision may be easily demonstrated by rapidly whirling a glowing match stick in a darkened room. Instead of seeing a single point of light, traversing a circular path, we see virtually a continuous circle of light. Could we place a tiny light on a disc which could be rotated at a speed of sixteen revolutions or more per

second, we should see only a perfect circle of light. This phenomenon was the underlying principle of the phenakistoscope, a toy of a former generation and the forerunner of all modern motion picture apparata. This toy consisted of a hollow drum around the upper rim of which were a number of narrow vertical slots. Inside the lower half of the drum was placed a strip of paper upon which was printed a series of pictures, each differing from the preceding one by a small movement. When the observer whirled this drum and looked through the slots the interruption of vision permitted a glimpse of the pictures only, with a resultant effect which was not unlike that of the modern motion picture, but, of course, far more crude. From such a trifle has grown one of the greatest industries the world has ever known.

Physiologists tell us that the average persistence of vision of the normal adult is approximately one-sixteenth of a second. Therefore, any motion repeated sixteen times per second should present to the eye an illusion of continuous motion. Early experimenters, basing their work on this statement, made and projected pictures at this rate of speed; but, as many of us can remember, the early pictures had a most painful flicker when projected upon the screen. In trying to overcome this obstacle the speed was advanced again and again until pictures were being made and projected at the rate of forty-eight per second, but for some reason the flicker persisted, and the speed was ruinous to the film. After long search, one experimenter tried inserting an extra blade in the shutter which would

cut off the light for an instant while the picture remained stationary upon the screen. This blade, the so-called "flicker-blade," proved to be so satisfactory that pictures could be projected as slowly as twelve to the second with far less flicker than had been possible before at much higher speeds. Following this discovery, the original speed of sixteen pictures to the second was once more made standard and so remains to this day, with certain exceptions which shall be explained later.

Owing to the fact that the motion picture does not actually move, but is a rapid succession of slightly different still pictures some mechanism must be obtained whereby the film may be exposed, and a corresponding mechanism by which it may be viewed. The camera mechanism must be such that the exposure may be made, the aperture darkened and the film moved forward one space, or "frame" as it is called, and this complete cycle repeated sixteen times every second. In addition, the film must be retained in the exact focal plane during the exposure, the amount of downward movement of the film must be exact to the thousandth part of an inch and the entire camera must be "rock" solid upon some suitable support. Neglect of any one of these points will render a successful motion picture impossible.

Before taking up the specific cameras suited to amateur work, I shall outline the methods by which this movement of the film is accomplished. Every successful motion picture camera has certain boxes or "magazines," which are used to contain the film, pro-

tect it from light, yet render it readily accessible for instant use. These magazines must, of course, be light-tight. They also carry the winding spools so that they serve as retort for unexposed film, reels to supply unexposed and to take up exposed film during the operation of exposure and for storage and transportation of exposed film. Some so-called daylight-loading cameras use a reel with solid sides and with the outer end of the film protected by a black paper wrapping, similar to the familiar roll film cartridge; but in whatever form the film carried may be found it may be regarded as a magazine and essential to the successful camera.

Second, there must be some means by which the film may be advanced. This is known as the intermittent movement, and incorporated with it is usually some arrangement of springs, cams or toggle-joints by which the film is firmly held in the focal plane at the instant of exposure. There have been many types of intermittent movements designed and used, only to be discarded. There are three basic designs upon which the great majority of successful movements have been based. The Geneva-star movement is familiar to all mechanics and was, I believe, the first successful motion picture intermittent movement to be used. This is the old Geneva movement which is used in many machines to advance a roller, pulley or gear through a portion of a revolution at equal and regular intervals. Standard motion picture film has four sprocket holes at the side of each frame, while the Geneva sprocket has sixteen teeth. Thus a four point star is used, so that each revolution of the cam advances the sprocket

one-fourth revolution and advances the film one frame. This movement is used on at least one camera to-day and proves quite satisfactory. The greatest drawback is its lack of wearing power, or I should say of its lack of resistance to wear. This necessitates constant readjustment of the movement. Although so rarely used in cameras, this movement is almost universal in projectors, where frequent adjustment is quite practical, and where rough usage must be expected.

Another group of movements may be known as the rocking claw movements. This movement consists of a pair of long arms bearing claws at their extremities which engage the perforations of the film and drag it downward. These arms have imparted to them by means of a crank, a slotted guide or other device, a circular movement in a plane perpendicular to the face of the film. For successful operation it is necessary that this circular path be flattened upon one side so that the movement shall be straight downward. This claw, or pair of claws, works in front of the aperture plate, the claws engaging through slots in that plate. The flattening is obtained by allowing the claws to strike the front of the aperture plate, and as they are mounted on springs, the springs flex and allow the arc to be flattened from the moment of engagement until that of disengagement. Other forms have a "D" shaped slotted guide in which the flat side of the guide secures the straight path of travel. These movements are used in some cheaper grades of news cameras manufactured in this country and are great favorites in English cameras of all grades. The movement is strong and

reliable for straight work, but it cannot be relied upon in multiple exposure work where the film must often be re-wound and re-exposed several times. It is also a very noisy movement. It does the work; and usually does it very satisfactorily, but it lacks the quiet operation and minute precision of the highest type of intermittent yet developed, the harmonic cam.

The harmonic cam is a multiple movement, actuated by two distinct cams. One of these cams transmits to the claw carriage an up-and-down movement only, and the other, the so-called drunken screw, moves the claws in and out. Thus the movement of the claw carriage is up-in-down-out-up-in-down-out, etc. This type if intermittent is used in some form in the finest professional cameras manufactured today. It was originated by Pathe Freres and is, of course, incorporated in the Pathe professional cameras. In addition to having this movement the best cameras have the claws machined to fit the perforations exactly, which renders possible multiple exposures without the slightest risk of mis-registration; however, this is a feature which is too costly to manufacture to be incorporated in a camera of the amateur type, nor is it at all necessary for straight work.

Any one of these movements will serve the amateur's purpose as he will seldom desire to make double exposures, and for all straight work, any of the three will be found to be very satisfactory.

When the film has been exposed the work has but begun for the true amateur, just as it has in still photography when the shutter has been released. There

follows the development of the negative, the printing and developing of the positive. At present the sixteen millimeter gauge film is all factory finished because the original film is developed and reversed to obtain the final positive, but I venture to predict that appliances for home motion picture finishing will be placed on the market at no far distant date, because the true amateur will not be content to let the other fellow have all of the fun.

The use of standard gauge film involves printing and developing processes just as still photography does, and special equipment is needed for this work. At any rate, some method, reversal or printing must in every instance be used to produce a positive film for projection. Then, when the positive is complete as far as chemical work is concerned, there follows the editing, the insertion of titles and the patching together of related scenes in their proper order, all of which will be treated in their respective places.

So much for generalities; now for particulars. Cinematography is not so much a department of photography as it is a division of that science embracing almost or quite as many departments as does the vast field of still photography. There is undoubtedly no field of still photography, with the possible exception of copying and restoring other photographs, which has not, or will not eventually have its counterpart in the motion field. Of course, we are all familiar with the usual, more or less, dramatic motion pictures of the theatre; but I wonder how many of my readers are familiar with the great number of practical uses to

which motion pictures are put at the present time. Probably second in importance is the news-work, which is, by the way, an excellent means by which the amateur may obtain financial returns from his motion work. This work embraces a wide range of topics for the reviews which are not of timely interest, but are analogous to the articles of general interest appearing in monthly journals. This will be taken up in detail later. This branch of cinematography gives employment to hundreds of "free-lances," workers who are not on the staff of any company but who make motion pictures and submit them on approval to the news companies, and who are to be found in all parts of the world. The sun never sets without having shone upon some enterprising cinematography "shooting" some scene or event which later will be flashed upon a thousand screens in as many theatres. Then, there is "stop motion" work as applied to puppets, dolls, cartoons and similar work. We have all enjoyed these amusing films without stopping to think of the immense amount of patient and careful work necessary to produce a few hundred feet of film. They are quite within the power of the amateur who has a capacity for endless patience and painstaking care to detail, for such a capacity is of far more value in such work than is an expensive outfit. Strange as it may seem, in this exacting work a camera will serve which might not be entirely satisfactory for ordinary work.

Motion pictures are also being used, to a rapidly increasing extent, in schools and colleges, where kinograms of scientific, historical and literary interest

are shown. To the amateur, possibly the only feasible educational field is that of natural science, such as the photography of wild life, birds, animals or reptiles. The field of stop motion may also be used to advantage here in photographing plant life and similar work. Motion pictures are also used by many manufacturers of products too bulky to be carried by salesmen. For example, the manufacturer of heavy machinery can supply his salesmen with a light projector and films which display his product in actual operation, which is obviously of greater value than any still photograph could ever be. This field is also open to the amateur after he has learned the simple laws of straight cinematography and can apply them successfully. Finally, there lies the vast, virgin field of home cinematography, both for individual pleasure and in a manner analogous to home portraiture, and it is to this field that the greater part of this work will apply.

Would you willingly part with that picture of your son, Bob, when he was first learning to walk? You would not take a fortune for it; but try to imagine how much more it would mean to you, could you but sit down of an evening and actually see those faltering steps once more! Or again, how many times have you shown fellow disciples of Ike Walton that photograph in which you are proudly displaying the "big fellow"? What would you give for a strip of film which actually showed the splendid fight he put up?

Cinematography represents a greater advance over still photography than photography did over hand-drawn pictures. It is more nearly re-creation than re-

production. Home cinematography is not difficult nor is it very expensive by modern methods; but it supplies us with records which will later be invaluable, to say nothing of the financial returns which are possible to the amateur who cares to go after them.

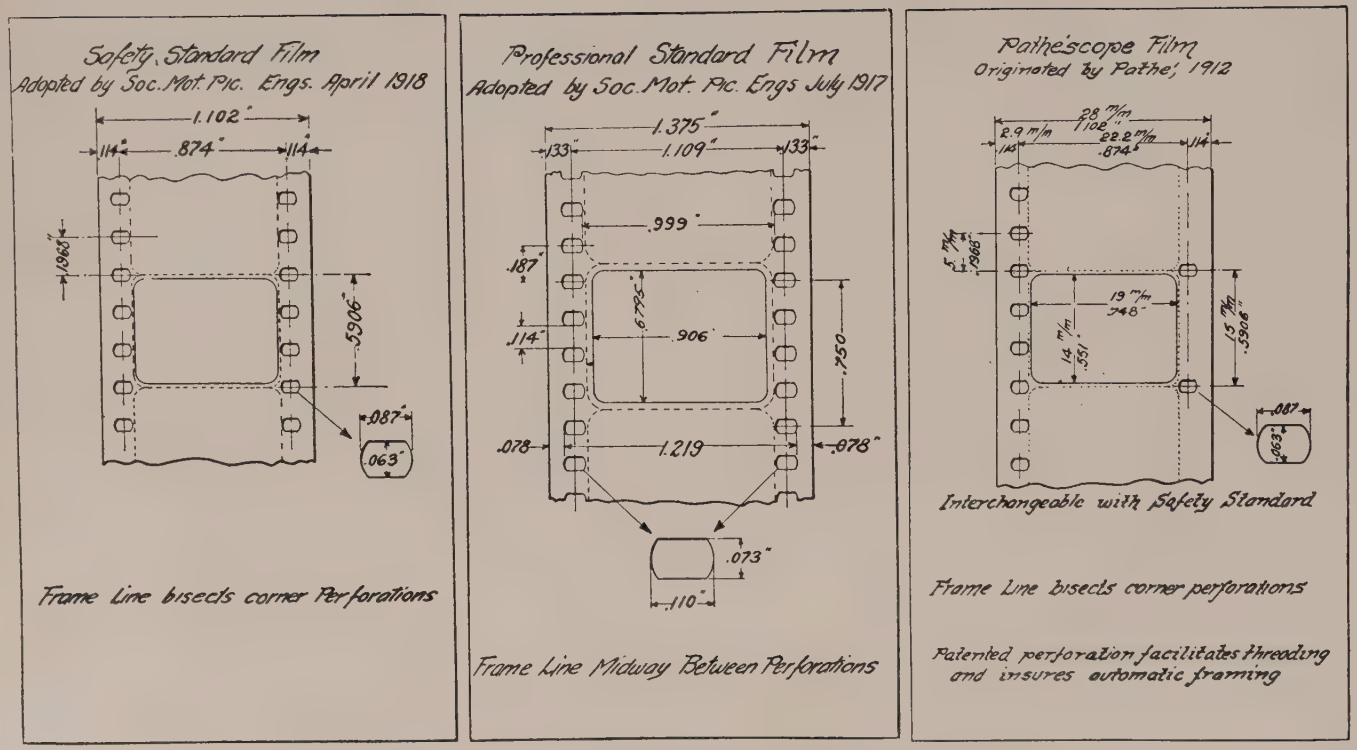
In the next chapter I shall take up the various cameras now on the market which are suited for amateur work, trying as best I can to point out the advantages and disadvantages of each together with such points of peculiar superiority which render them individually adapted to special lines of work. It is impossible to review every camera made, but in describing those available I shall try to deal with each with absolute fairness, and should any point in my descriptions appear to be misleading I shall be very glad to have such errors called to my attention. I wish to acknowledge my appreciation of the splendid co-operation I have received from the various dealers and manufacturers in supplying me with material with which to work. It is obviously impractical for any one to purchase a sample of each camera on the market, and realizing this, many of these manufacturers and dealers have taken a great deal of trouble to supply me with exact data, photographs and have even made arrangements whereby I could, in many cases, give their cameras a thorough inspection and try-out. I wish to express my feeling of indebtedness to them in this place.

Chapter II.

AMATEUR MOTION-PICTURE CAMERAS

THE choice of a motion-picture camera depends necessarily upon the kind of work to be done with it, just as is the case with still cameras. For the present, therefore, I shall consider this subject from the point of view of the average amateur. In considering these amateur cameras, there are various points wherein they differ from the professional motion-picture camera, such as in size, portability, movement and, finally, in the kind of film used. The physical form of the film varies widely in different cameras, although it is usually a continuous ribbon with holes punched along one or both edges. Others use broad belts, discs, and other forms of film. In considering cameras I shall start with that form most widely different from the professional and work up to those using the standard motion picture film in rolls of two hundred and four hundred feet.

First, there is the strictly amateur motion picture camera manufactured by the Vitalux Cinema Company. This camera uses an endless belt of film about six inches wide and roughly eighteen inches in circumference. This film is driven in a circular path by means of a series of sprocket holes in upper and lower edges. As each individual frame is exposed, the lens drops a slight fraction of an inch, so that at the end of the



This diagram shows the comparative sizes of the three larger film gauges as adopted by the Society of Motion Picture Engineers.

first revolution of the film belt the exposed frame lies immediately below the first frame exposed. The film continues until filled in this manner with a long spiral of pictures. The individual frames exposed by this camera are much smaller than the standard frame, and the belt provides room for 1664 frames. Made and projected at the rate of fourteen per second, as recommended by the manufacturer, this belt will provide approximately a two minute run, slightly less, or an amount equal to one hundred and thirteen feet of standard film.

This camera is light and compact, it measures 4¼ x 8½ x 11 inches, a size which is easily handled. The films coated on non-inflammable stock are carried in individual magazines which can be interchanged by daylight, so that as many films as desired may be exposed without recourse to a darkroom. The camera is fitted with a Goerz f/3.5, short focus motion-picture lens and is photographically as efficient as a professional type of camera costing more money.

One of the most appealing features of this camera is the low cost of operation. For purposes of future comparison I shall outline the usual standard cost. The standard reel contains one thousand feet and runs on the screen sixteen minutes. The negative costs forty dollars, development of the negative, printing of the positive, cost of positive stock and development of the positive will cost at least sixty dollars more making the total cost one hundred dollars, sixty-five of which is the actual cost of the stock, and thirty-five for printing and two complete developments. This makes standard

gauge film cost six dollars and twenty-five cents per minute screen time.

To return to the Vitalux camera. The film costs seventy-five cents per belt and the same for the positive. Complete development service is furnished for twenty-five cents making the total cost one dollar and seventy-five cents each, or eighty-seven and one-half cents per minute screen time.

This company also makes reductions from the familiar screen-productions featuring favorite artists, also scenics and other films; in short, a complete assortment of screen features, which are sold at a price comparable to that of a phonograph record, namely, one dollar and ten cents each; or more for special productions.

The gravest disadvantage of this camera is that certain imperfect or superfluous frames cannot be removed, so that the film must be "edited" as it is being made. It also renders impossible the operation of tinting sections of the film different colors, a process which, although requiring care, is not beyond the capabilities of the average amateur and one which adds greatly to the appearance of the finished film.

Recently, several cameras have appeared which use the new sixteen millimeter sub-standard film which was originally produced for use in the Cine-Kodak. This film is furnished in rolls of fifty and one hundred feet, but these are equivalent to one hundred twenty-five and two hundred fifty feet of standard thirty-five millimeter film respectively. The one hundred foot reel of sub-standard film costs six dollars, which is the total

cost. When the film is exposed it is sent to the Eastman Kodak Laboratories at Rochester and the finished positive is returned ready for projection, postpaid, with no further cost. This film is not printed as is the standard film. Instead, the film is taken through a process of reversal so that the positive which is returned is the

The Cine-Kodak

actual ribbon of film which was exposed in the camera. Arrangements have been made, however, to obtain duplicates of any film desired at the original price or six dollars per hundred feet. Four hundred feet of film, costing twenty-four dollars, has the same screen time as the thousand foot standard reel, or one dollar and fifty cents per minute, screen time.

The projectors used with this film accommodate four hundred feet of film, which is equivalent in screen time to the one thousand foot reels used on standard projectors. This small film may be cut, spliced, tinted, edited, titles inserted and in every way subjected to the same processes by which the professional films are completed. The stock is non-inflammable and may be

used in an open projector without enclosing booth. Many of the projectors are so arranged that a single frame may be projected motionless, on the screen giving the added advantage of the stereoptican.

The usual lens on this type of camera is of twenty-five millimeter focus. It is well known that the shorter the focus of the lens, the greater the depth of focus at a given aperture. This short focus lens has made it quite practical to use a fixed focus mount, as, indeed, one manufacturer has done, with retention of detail sufficient for satisfactory projection. The actual frame exposed measures seven twenty-fourths by ten twenty-fourths of an inch. This is usually projected at a maximum size of thirty by forty inches, or an enlargement of ninety-six diameters. The standard film projected in proportion will render an image eight feet wide, but as the screens used in theatres are usually nine by twelve feet and larger, it will be seen that the small film, made with a lens of greater depth of focus, is subjected to a lesser degree of projection enlargement than the standard. Naturally, this means that all chances are in favor of the smaller picture being the better. It is only the skill of the professional cinematographer which brings the balance back to the side of the standard film. Briefly, the new sub-standard cameras should yield the utmost satisfaction in the hands of even the most inexperienced amateurs.

The first camera to appear which used this film was the Cine-Kodak. This is a beautiful instrument entirely in keeping with the other de luxe products of this company. It measures 6 x 4⅝ x 8⅝ inches and weighs but

7¼ pounds. It is fitted with the Kodak anastigmat lens, f 3.5, of 25 millimeter focus. It is also fitted with a range finding finder which accurately indicates the field of view at any distance. On the back of the camera are dials which indicate the lens diaphragm, the distance scale and the amount of film exposed. The camera is of metal, finished with flake black enamel and has a folding hood which protects both photographic and finder lenses, and which acts as a sunshade when opened. The intermittent is said to be fool proof and of such design as to be practically indestructible. The outfit as furnished by the factory includes a revolving and tilt head tripod and a projector. A tripod of this design is almost a necessity to the worker in cinematography, as it saves a great deal of time which would otherwise be lost in arranging the tripod. The camera is readily portable; and it is needless to say that its performance is of the best as may be expected of an Eastman product.

Soon after the Cine-Kodak appeared on the market, the Victor Animatograph Company announced their Victor cine camera and a projector to accompany it. This camera has not the de luxe features to be found on the Cine-Kodak, but as it costs less than one-third the price of the Kodak, it is certain to gain wide popularity.

The Victor camera uses the standard, sixteen milli-

The Eastman Company recently introduced a spring motor for operating this camera which makes it even more valuable as an amateur instrument. By using this motor, which is controlled by a push-button, the tripod may be dispensed with and the camera used in the hands, making it very easy to follow any action.

meter miniature film, or the sub-standard as it is sometimes called. The magazines have a capacity of one hundred feet of this film, equivalent to two hundred fifty feet of standard thirty-five millimeter film. The camera is box form, measuring 3 x 5¾ x 8¼ inches and weighing five and one-half pounds. It is finished in flake black enamel, and presents a handsome appearance. It is made of aluminum, and will not be greatly affected by atmospheric changes.

Victor Cine Camera

The intermittent is a double push-claw and is as nearly indestructible as a moving mechanism can be made. This, with the simple three gear driving mechanism, makes this an ideal camera for the average amateur, or the greatest enthusiast. The shutter is the fan blade type common to motion cameras, the lens a 25 mm., focus working at a maximum aperture of f 3.5. The finder is of the sure-shot type, mounted on the top

of the camera, and is, of course, subject to the error common to this type of finder when used at short distances. I should suggest the use of a divergence determiner with it.

The Victor camera has some very useful refinements which will appeal to the amateur. A special exposure meter is furnished which is of great value, saving many feet of film. The shutter has a maximum opening of 220° which is unalterable. The usual professional camera has an adjustable shutter with a maximum opening of 170° or 180°. The Victor shutter, of course, admits more light per revolution. The exposure at the normal speed of two crank revolutions per second is approximately 1/25 of a second. This is fast enough for ordinary work, but will not give satisfactory film when exposed on rapidly moving objects, such as automobile races. As the crank ratio is but 7:1, two frames per second are saved, so that every seven seconds a second is gained. The speed of fourteen to the second is satisfactory and the subjects photographed on a given length of film may be lengthened by one-seventh, a considerable saving. The lens of the Victor camera is fixed focus, so that focusing may be dispensed with. As explained before, the short focus of the lens and the comparatively small degree of projection enlargement make this feature practical. This leaves but the single adjustment, the diaphragm opening, to be considered by the operator. This simplifies the operation of the camera. The camera is provided with sockets to take both the standard camera tripod and the standard motion picture tripod. Thus, for hiking, picnics and other

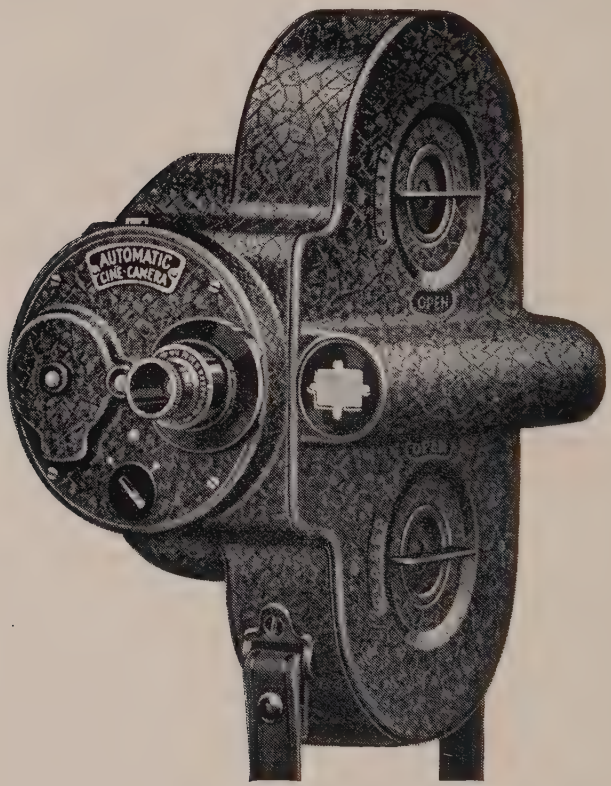
journeys when the picture making is incidental, a light, still tripod may be easily carried, but in making home dramas, the motion tripod with its features of revolving and tilt head may be utilized. Probably the greatest refinement of the Victor camera is an arrangement whereby the beginner's tendency to slow on the up-crank and push the down-crank movements is automatically compensated, so that the inexperienced operator can produce passable film. These features with the low selling cost of the camera will make it widely popular.

A third camera using the sixteen millimeter film appeared, and promises to make a strong bid for supremacy in this field. The Bell & Howell Company, who make the world's approved standard motion camera for the highest class of professional work, have, after a long period of research, produced a camera which seems to have all of the refinements which could be asked in an amateur camera.

This camera is as easily carried as a field glass of the old type, or as a larger size roll film camera. The camera measures 3 x 6 x 8 inches and weighs but 4½ pounds. It is finished in flake black enamel. The capacity is 100 feet of sixteen millimeter film. The lens is the usual sub-standard 25 mm., focus, f 3.5 motion picture lens. The manufacturers state that the intermittent is only surpassed by that used in their professional cameras for reliability, accuracy and wearing qualities. In short, the materials and workmanship are of the highest possible quality, and the accessories of the best. The finder is of the direct tube type, very

similar to that provided on the Bell & Howell professional camera.

The two bug-bears of amateur cinematographers are cranking and the necessity of carrying a bulky



The Bell & Howell Filmo Camera

tripod. Both are eliminated in the Bell & Howell Automatic camera. The camera is held and sighted in a manner very similar to that used in handling field glasses. With the subject located in the finder a button

is pressed and the mechanism starts and runs at the proper speed. The subject may be followed through both horizontal and vertical planes, without the jerkiness so evident on the screen when films are shown which have been made by an amateur trying to operate the pam and tilt of the professional tripod. In addition, the camera may be set to make single exposures, 4000 of them with a single loading. The projector, which will be described in its own place, is adjusted for showing single frames, so that this camera provides all facilities for lantern slide work as well as motion work. I believe that it will be a long time before this camera is surpassed. It is the last word in simplicity. Raise the camera, sight the subject and press the button. In addition it is manufactured by the firm which have set the standards in motion picture apparatus and who do nothing else. This camera can be safely recommended without reservation to amateurs who want good film from the first reel.

Some years ago the Pathescope Company announced the manufacture of a home projector using an incandescent lamp for a light source. They also announced a library of films of various subjects which could be obtained for a modest rental. The plan proved to be very successful and soon a camera was demanded by the public. This was produced on the lines of the Pathe Field camera, but it was too expensive to prove widely popular. This company then produced their Pathescope Home camera, which is inexpensive, but a remarkably well made instrument. It is of leather covered wood construction and measures

4¾ x 9½ x 9½, with the lens projecting 2½ inches complete with sunshade and focusing mount. The lens provided is a Butcher-Aldis, 1.7 inch focus, working at a maximum aperture of f 3.1. The mount is very sturdy and will stand abuse which would ruin the delicate jackets of the usual focusing mount.

The intermittent is a double claw, an adaptation of the Williamson movement so widely used in English cameras. This movement works behind the film gate, and with all other mechanism is enclosed in the single chamber of the camera box and is readily accessible for adjustment or repair. The crank is attached to the feed sprocket which is of approved professional type, feeding the film into the gate from its top side and taking up the exposed film on its bottom. On the same shaft is a master gear which operates the balance wheel and the 90° spiral gears which in turn operate the shutter. A spring belt from the master gear operates the take-up which is of professional pattern, and finally the film register, a novel idea in this line, is actuated by the master gear. This register is a large dial calibrated in 100 divisions, each marking one foot, with half way calibrations between. At each crank revolution this dial is advanced one notch, giving an easily read and positive film register.

The camera generally is of the type used widely for professional work before the introduction of the Pathe Professional Camera, and a type which is widely used in England at the present for professional work. The camera has a single chamber, and a single casting upon which are mounted the master gear and two 90° spiral

gears, the take-up spool, the film register, the shutter shaft, the claw crank and the feed sprocket. There are no other moving parts subject to friction or wear. The shutter is double bladed and makes but one-half a revolution to each complete cycle of the claws, reducing the actual speed of the shutter by one-half.

The film used is the Pathescope standard 28 mm., non-inflammable film. This film has 20 frames per foot, or a 25% increase over the 35 mm., standard film. The saving in not great, nor would the establishment of a new standard have been justified from this viewpoint alone, but as this film was made for use in home projectors without the use of an enclosing booth it was necessary to provide some means to prevent the owners of such projectors from using the larger inflammable film. For this reason the 28 mm. gauge was established. The Pathescope film may be readily recognized for on one edge it has one perforation only for each frame, this perforation being located directly opposite the frame line. On the other edge it has the usual four perforations, one of which occurs opposite the frame line as in European cameras. The Safety Standard film, as adopted by the Society of Motion Picture Engineers in April, 1918, is the same size and style, but has four perforations per frame on each edge of the film. Thus safety standard may be used in Pathescope cameras and projectors, but not vice versa, for the usual safety standard projector has a full-toothed sprocket and the original Pathescope film has no perforation for these teeth to engage.

The Pathescope outfit is not the ideal camera for

the enthusiastic amateur, who has the *modus operandi* as his great interest, but for the usual man who wants a good home outfit, with a great film library accessible from which he may rent films of almost any imaginable subject, it is the ideal camera. A glance through the pages of the Pathescope film catalog will be a revelation to those interested in home projection.

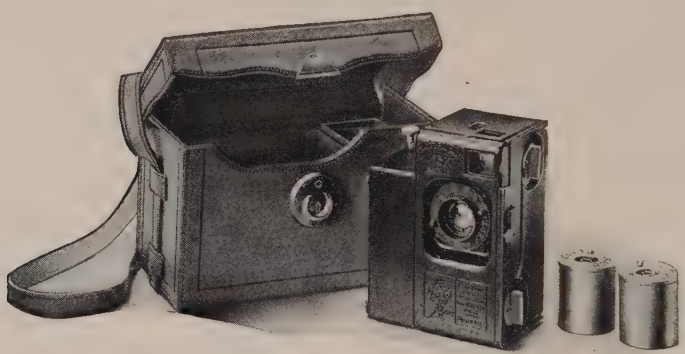
For the manufacturer who wishes to provide his salesmen with film showing his products, for the traveling lecturer, for the school and for all purposes where a highly efficient system of motion picture making and projecting is required and where the picture must be projected without the use of an enclosing booth this system cannot be surpassed. As a means of home entertainment it is in every way equal to, and to my mind, far superior to either the phonograph or radio. This camera is supplied with a tilt and pam tripod ready for use. The film is supplied in spools, the end being protected by black paper as in the usual roll-film cartridge so that darkroom loading is not necessary.

The demand for motion cameras for amateur use first resulted in the manufacture of small cameras using short lengths of standard film, and many of these are selling with great success. There is one advantage which this type of camera will always possess. If it is any good at all it will produce news film which may be sold to the publishers of news reels and as the usual price paid is one dollar per foot for all acceptable film, the opportunity to make cinematography pay for itself is very good, indeed. Here already we have the friendly differences among amateurs which we find

when any subject is broached. The amateur cinematographic world is divided into three camps. The sixteen millimeters, the twenty-eight millimeters and the *standards*. Surely! You will always find that the standard convert usually capitalizes, underscores and italicizes that word. It is his fetich. Well, joy to him. I may as well confess that as a professional cinematographer I belong to his camp, but to whisper of treachery, I believe that I shall soon possess a sixteen millimeter outfit. Why? There are thousands of scenes I wish to preserve for my own use, scenes which I could never hope to sell, and the difference between twenty-five dollars and an amount which may range anywhere between one hundred and one hundred fifty is enough to buy a lot of equipment which I do not need but which I want badly. That difference is the difference between the finished costs of the full reels of standard and sixteen millimeter film.

Among the first "short-strip" cameras to appear on the American market was the Sept camera, an instrument of French manufacture. It takes only sixteen and one-half feet of film, and uses standard gauge film, but withal it has made for itself a lasting place in the cinematographic world and has won a wide and great popularity. It is a camera of which the owner will enthusiastically say, "It's a great little instrument!" The camera is of metal construction and measures 3 x 4 x 5 inches and weighs less than four pounds. It is furnished with a carrying case and six magazines. The lens is a two inch (50 mm.) f 3.5 lens in a micrometer focusing mount. This is the primary optical

equipment of the expensive professional cameras. This arrangement allows the production of negatives which may be enlarged to 16 x 20 inches. As the camera is equipped for single frame exposure, this feature alone makes it worth the price for a tourist camera, containing film for 250 exposures at a filling. The manufacturers state, and their statement seems to be justified, that this camera is eminently suited for home portrait-



The Sept Camera

ure, landscape, pictorial, commercial and any type of photographic work which is ordinarily done by amateur and professional. In addition it is a really efficient motion picture camera. Its quality may be judged by the fact that professional travelers, news men and the large studios have added Sept cameras to their equipment for quick action work. The falcon fight which appeared in Fairbank's "Robin Hood" was made with a Sept.

This camera is automatic in action. Merely press

the button and it automatically operates, leaving both hands free to follow the subject in either the "sure-shot" or the "brilliant" finder both of which are provided. The combination of portability, highest grade optical equipment, automatic action and single crank exposure make this one of the most nearly universal cameras ever manufactured. It is indispensable to the news man. Although it is entirely practical to use the Sept in the hand, a tripod socket is provided for use when desired.

There recently appeared on the market a small motion picture camera bearing the Ica trademark. This camera, known as the "Kinamo" is made with all of the care and attention to detail which characterize all Ica products. It is covered with leather and although of slightly different dimensions, it does not look unlike a Kodak of one of the *larger* sizes. The crank is sufficiently large for ease in manipulation although not at all obtrusive. The camera is equipped with an Ica iconograph finder which folds back against the camera when not in use. The Kinamo is made in two models, the "A" model measures 4½ x 2½ x 6 and weighs 2¼ pounds. Its capacity is fifty feet of standard gauge film. The model "B" measures 2½ x 5⅛ x 6 and accommodates eighty feet of film. Otherwise the two models are very similar.

The Kinamo is equipped with a Carl Zeiss' 40 mm. f 3.5 lens in focusing mount. Focusing is done by scale. The camera is provided with a tripod socket to take the standard still tripod, the camera being too light to make the use of the bulky motion tripods practical.

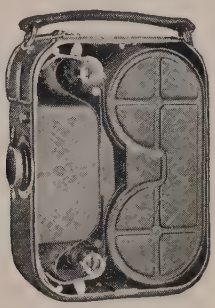
The camera has two crank shafts, one for the usual 8:1 motion work, the other for single exposures, making this camera an efficient tourist camera. It is also provided with a punch to mark the termination of each scene and a register to indicate the amount of

The Ica Kinamo Camera

film exposed. The Kinamo has no competitors and is unusually well adapted to its particular field. It provides a camera worthy of a place among news cameras, which is easily portable and which takes a sufficient footage to secure almost any desired subject. It would be manifestly unjust to compare it with the bulky news cameras, for it is intended to cover a different field, for the same reason it cannot be compared with the

sub-standard cameras. It fills a certain need and one which is satisfied by no other camera.

So much for the purely amateur camera. Yet the border line between amateur and professional is so vague that the last three cameras described, although



Interior of the Ica Kinamo

they are marketed for purely amateur use, are used in both professional and semi-professional work. It is difficult to choose from among these cameras, and the only hint which can be given is this: Determine the amount your pocketbook will stand, then carefully study your prospective field of work and purchase the best camera which will adequately cover this field. Each of the cameras has outstanding features of its own and any of them will yield the most gratifying results.

I have purposely omitted the cheaper grade of toys and inferior cameras which will not produce results. However, I do not wish the inference to be drawn that all cameras which have been omitted fall into this class. Neither have I tried to cover the foreign field. There are, undoubtedly, many excellent cameras which I have

not described and of which I have never heard in the foreign field. I know that there are American cameras I have omitted solely because I have not had the opportunity to examine them nor the opportunity to obtain authoritative information concerning them. I have, however, covered all of the types of motion cameras which have been proved to be practical, and the type description should be a guide in the purchase of any camera.

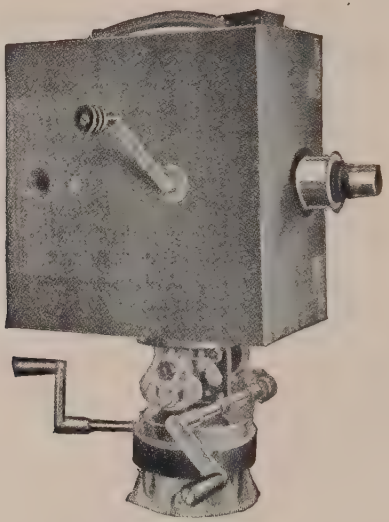
Chapter III.

NEWS AND TOPICAL CAMERAS

HERETOFORE we have considered only those cameras which are purely or primarily for amateur use, but there are also many cameras on the market which, while intended for the news cameraman are very suitable for the amateur who desires a somewhat more professional instrument. There are many of these on the market, and a large percentage of those offered are worthless. I shall endeavor to describe the principal dependable types easily obtainable on the American market.

There is a small, inexpensive camera on the market known as the Home De Franne. This camera is emphatically not a camera for the cinematographer who intends to make a business of news work, but for the amateur who wants a small outfit, capable of fair work, yet one which uses standard film, it is very good. The camera measures 7⅛ x 9½ x 3⅞ inches, and weighs six and three-quarter pounds. The camera is offered with either f 6 or f 3.5 lens, the f 3.5 being worth the extra amount charged for it. The camera may also be equipped with an outside focusing prism for ten dollars extra. The camera is covered with leather and takes one hundred foot spools of daylight loading film which is packed like the Pathescope daylight loading film described in the last chapter. An ingenious design makes

it possible to attach the reel to the camera movement and lens and thus the one mechanism embodies both camera and projector. This is thoroughly practical, as the intermittent is of the Geneva star type. The outfit, which consists of camera, projector, tripod and

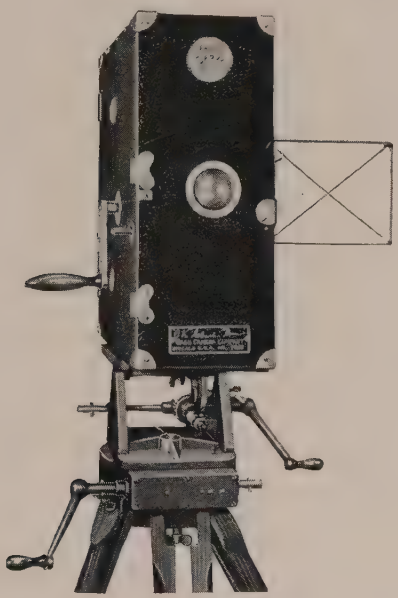


The Photo Cines Camera. This is a moderately priced camera made by the manufacturers of the well known Photo Cines professional cameras. It is an excellent topical camera, and capable of making good film.

screen is sold as a unit, for one hundred dollars, which price includes the f 3.5 lens.

For some reason, the German cameras have gained supremacy over our own in the field of inexpensive news models. The Ertel De Franne is an example of this. This camera measures 4⅞ x 11¾ x 11⅜ and weighs 12½ pounds. It is furnished in natural wood finish, mahogany or oak, and has a capacity of two

hundred feet of film. I examined one of these cameras a short time ago and was surprised at the fine quality of materials and workmanship which was displayed, for the camera with pam and tilt tripod sells for one hundred fifty dollars. The gears are helical cut from phosphor bronze and the entire mechanism is fastened



The Ertel De Franne Camera

to the bottom of the camera, on a one-piece casting. The shutter is machined from a heavy sheet of metal and acts as a balance wheel, as in the most expensive cameras manufactured. The intermittent is of the harmonic cam and shuttle type, which is also a feature usually found only in strictly professional grade cameras. The design is such that vibration, the bug-

bear of the news-man is practically overcome. The film magazines are round and of aluminum, and refilling is very simple. The magazines are separate units, the emptied retort serving as a take-up magazine. Direct focusing is accomplished by means of a tube running through the camera and stopped with a spring door. The lens, working at f 3.1 and of 50 mm. (2 inch) focus, is mounted in a spiral focusing mount. Both focusing and diaphragm are actuated by rods extending from the side of the camera through a slot along whose edges are marked scales for distance and stop, thus both adjustments are easily and delicately made with no necessity of going to the front of the camera. The movement is arranged for forward, reverse and single crank work. In fact, every kind of work may be done which may be done with the professional camera, except for the automatic fade, and as the diaphragm is actuated by a rod moving through an arc of about 75°, a little practice will enable the operator to produce hand fades which will serve every purpose. The camera is also provided with an iconograph finder, and as there are a series of peep holes in the sight bar, the finder is an accurate range finder, the exact field at various distances being shown. With careful work and a few accessories which can be easily made at home, any work which is done in the large studios may be easily duplicated with this fine little instrument.

The least expensive American news camera with which I am familiar is the little two hundred foot model furnished by the makers of the well-known

Wilart Professional camera. This Wilart News model is of metal construction and very compact. As in the case of the highest grade professional cameras, the camera mechanism is a single unit with double, outside magazines. The camera alone measures 6 x 6¼ x 7, and the lens mount adds two inches to the length, making it nine inches over all. The weight is 8½ pounds. The magazines increase the height to 11½ inches and the length to 14 inches. The magazines weigh 3½ pounds each. By removing the magazines the camera may be carried in an ordinary handbag. The mechanism is operated from a master gear running on the same shaft with the single sprocket feed mechanism, and the intermittent is of the Geneva star type. The camera is equipped with a reflecting direct focusing tube and has a sure-shot finder mounted on top. The take-up is actuated forward and reverse by spring belt. The aperture plate and film channel is easily removable for cleaning and the pressure plate designed for perfect contact with aperture plate. A single crank shaft is provided. A film register is also provided.

This camera is capable of turning out high-class news film and will find a wide sale among news men. This camera is also furnished in a high speed model although the two types are not interchangeable.

There are probably few of my readers who have not seen the Universal motion picture camera. It represents the highest type of news camera yet produced. It is made in two models and may be purchased with all refinements including lens turret and automatic dissolve mechanism.

The camera is of metal construction, and being grounded through the crank and operator, static is practically eliminated. The entire mechanism is mounted on a single casting, reducing vibration to a minimum. The actual framework is of hardwood, but the doors, front plate and bed are of aluminum alloy. The camera will stand unlimited abuse without injuring its capacity to turn out high grade film. This

The Universal Camera

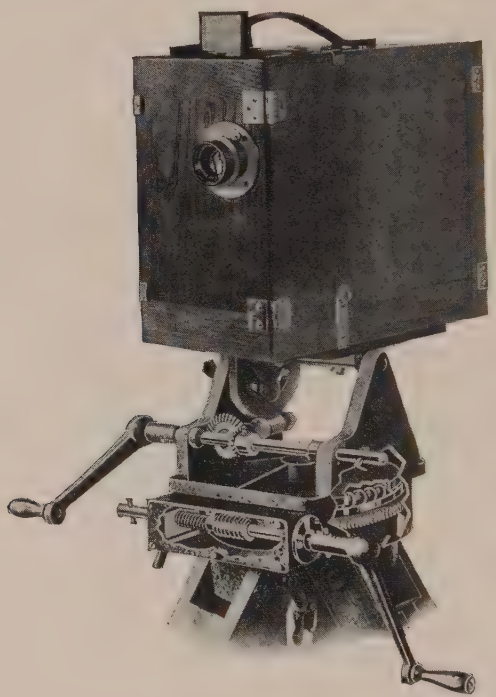
camera has been used successfully in all parts of the world from the tropics to the arctic regions. It has stood up in sweltering tropical jungles and in waterless deserts. It has been used by such men as Rainey, Holmes, Johnson and other travelers and explorers.

The camera is made to take either 200 or 400 feet of film, depending upon the model. It may be fitted with all of the trick "effects," and a turret accommodating three lenses at one time. The later models are regu-

larly supplied with automatic dissolves and a masking slot is provided. The movement is forward and reverse without changing belts or other adjustments. Merely turn the crank backward. A single crank shaft is also provided. The movement is the highly perfected harmonic cam and shuttle movement used in the highest grade professional cameras. It is provided with indicators which register the film footage used and the number of individual turns, a feature invaluable in trick work. It is focused by a prism opening through the side of the door. In short, I do not hesitate to say, speaking from experience with this as well as with the most expensive cameras made, that in the hands of a careful workman this camera will produce film, in every way comparable with that produced by the most expensive cameras available, and all effects used in motion pictures today can be duplicated with absolute fidelity. It is, perhaps, an injustice to list the Universal with the news cameras, for it is really a professional or studio grade instrument. However, most of the work in studios is done with more expensive cameras and these will be considered by themselves.

Another very good type of camera is the Ernemann models "A" and "C." These cameras are very compact, yet they have the straight line film travel. They are made in capacities of 100 and 200 feet. They are fitted with a high grade anastigmat lens working at a maximum aperture of f 3.1. The cameras are finished in natural wood, and present a very neat appearance. They are fully good enough for all usual news work

and are very easily carried owing to their small size. A light weight tripod with both panorama and tilt head is furnished making this an outfit very suitable to the man to whom weight and bulk is an objection.



The Ernemann Camera

There are other models which serve the news man well. The principal points which should appear in the news camera are: Portability, a lens with at least a maximum opening of f 3.5, a film capacity of at least one hundred feet, both visual and scale focusing and a view finder which is fairly accurate. A tripod with both movements should be used, and one with an ex-

tension which will, when necessary raise the camera above the heads of the crowd which is almost always present when any event of news interest is taking place.

A news camera must have a good intermittent and a good gate. That is, the film must at all times be held firmly in the focal plane so that the focus is at all times as sharp as possible, and the movement of the film must be most accurate so that there will be no jumping on the screen.

For the man who proposes to engage seriously in the news field, I cannot too strongly recommend that the best camera possible be purchased. Many purchasers of news film ask the name of the camera used in making the film, and, of course, preference is given to the film made with the better camera, for the screen quality of the film will most probably be better than the film made with the inferior camera.

Chapter IV.

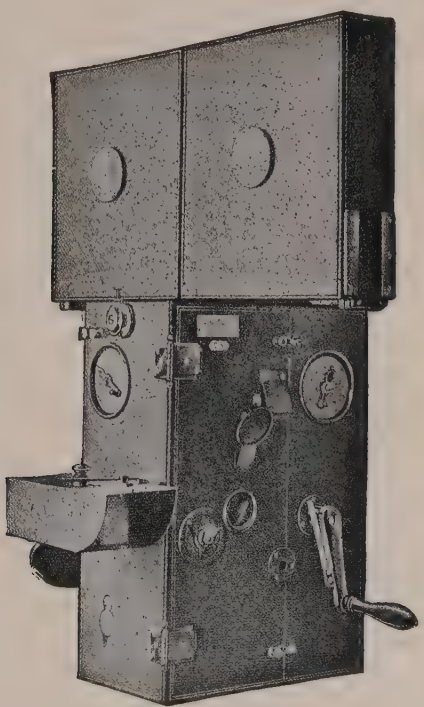
PROFESSIONAL CAMERAS

IT is not advisable for the amateur to invest in a professional type of camera, no matter how well he can afford to do so, unless he expects to engage in some branch of motion picture work which will prove profitable, for the advantages thus obtained are not great enough to justify the additional expense. However, in case some of my readers wish to get the best equipment obtainable, I shall briefly describe the professional cameras in use today in this country.

First, there is the old stand-by, the Pathe Studio Model. For many years this camera was the standard of the world, and it is widely used in the highest class studios today, and there are many cinematographers who would not consider using any other camera. Although this is true, it is also true that the Pathe is one of the least expensive of the truly professional cameras.

The Pathe camera, that is, the so-called camera unit, measures 4¾ x 8 x 12 inches, and weighs twenty-two pounds. This unit is the camera mechanism only. The magazines are of the outside type, and hold four hundred feet of film as do the magazines of all of the truly professional cameras. Both camera and magazines are covered with black leather and all metal fittings enamelled black. This prevents all disturbing light reflections. A peculiarity of this camera is that the

broad side of the camera unit is toward the front, and the crank operates from the back. On the back of the camera is a dial which indicates the amount of film used and another which indicates the focus of the lens, so that scale focusing can be used without having



The Pathé Studio Camera

to go to the front of the camera. Another door at the back covers the focusing aperture which is used in direct focusing. The camera is provided with both the 8:1 and the 1:1 crank movements and reverse. The take-up is of the spring belt type, and as the driving belt is visible while operating the take-up can be

checked at any time. The Pathe camera is regularly supplied with an automatic dissolve. The mechanism of this device is not the usual double shutter, but is operated by gradually closing a diaphragm. The fading of the light in the shutter dissolve has an accelerated motion. That is, at the beginning of the dissolve there is little change apparent, but as the dissolve progresses, the picture fades out with a jump. This is not true with the diaphragm dissolve in which the fading of the light is uniform throughout the dissolve.

This dissolve must not be confused with the "iris-out." The effect upon the screen is a true fade, just as the fade made with a double shutter, but the effect is more uniform.

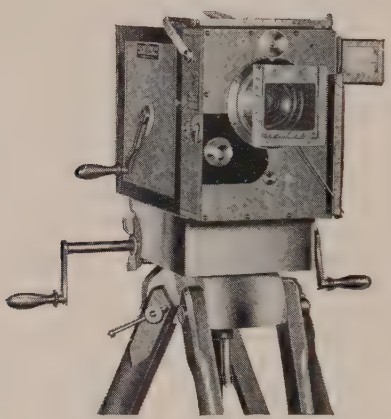
The Pathe camera has an adjustable shutter which is supplied for giving short exposures in photographing objects moving at a high rate of speed. The finder is of the ground glass type, is of large size and provided with a roomy hood. The finder swings so that it may be adjusted to show the exact field at any distance from the camera. This is an invaluable feature in close-up and trick work. The front of the camera may be removed to give access to the shutter and the dissolve mechanism, and a door in the back is opened to thread the film. The intermittent is worthy of note, for it is the original Pathe harmonic cam and shuttle, a type of intermittent which has been copied by the manufacturers of almost all high grade motion picture cameras. This is the type of intermittent in which the claws move in four straight lines, up, in, down, out instead of in a circle, flattened on one side.

This camera may be fitted with all of the usual "effects" and is in every way a professional camera of the highest type, yet one dealer at least, sells this camera, brand new, complete with Zeiss Tessar lens and two magazines for six hundred and fifty dollars.

Another high-grade camera is the Wilart. This camera is of all metal construction, and closely resembles the Pathe in general appearance. Indeed, it is often called "The American Pathe." The principal points of difference between this and the Pathe are: The Wilart is of all-metal construction which not only permits accurate action under any climatic conditions, but also does a great deal toward the elimination of "static," the bug-bear of cinematographers in cold climates. This is a branching, tree-like marking which is caused by tiny sparks of static electricity generated by the friction between the film and the gate. The Wilart camera is equipped with the more usual shutter dissolve. It has the usual dial footage meter, and also an in-built Veeder counter which records the individual feet of film used. It, of course, has a film punch, as have all professional cameras. The intermittent is of special design, but is a development of the harmonic cam and shuttle, actuated by the "Wilart Drunken Screw." There is also a view finder with a scale which permits it to be set to include the correct field of view at any distance from the camera.

Another high grade camera is the De Brie, also of French manufacture but closely imitated by the German Ernemann people. The De Brie camera is a small and compact walnut box, finished in natural wood.

The camera is self contained, the four hundred foot magazines lying side by side in the box. The first loop, which corresponds to the upper loop of the usual type of camera, is a spiral loop, which provides space both for the loop proper and for the lateral displacement of the film, causing it to feed accurately into the upper end of the gate. This camera is probably the highest type of news camera ever devolped, and is extensively

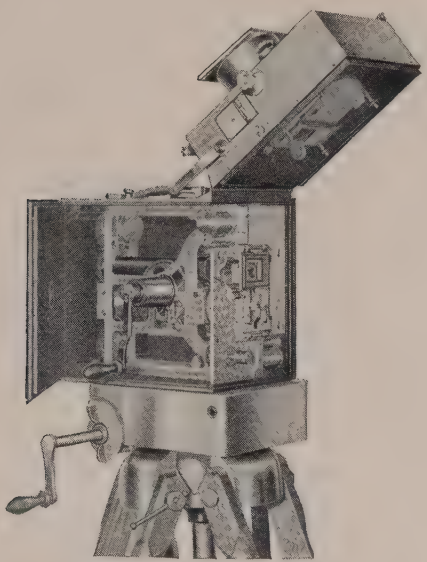


The De Brie Camera

used by professionals for work on location where the bulk and weight of the studio camera is an objection.

This camera has a unique arrangement whereby the focusing and diaphragm scales may be observed from the operating position at the back of the camera. The two movable elements of the lens mount have long rods attached. These extend beyond the limits of the side and top, respectively, of the camera box. These rods slide along other rods which are graduated. The focusing rod has four scales engraved upon it, one

on each side, so that lenses of four different focal lengths may be used. The camera may be fitted with the usual Goerz or other "effects." It is provided with a direct focusing tube for vizual focusing, both the usual and the one to one crank movements and reverse. The dissolve is of the double shutter type. Film meter and punch are provided. This camera is also provided



The interior of the De Brie Camera

in the high-speed type for slow-motion photography. The regular model costs fifteen hundred dollars and the high speed model, three thousand dollars. The film produced, is, of course, as good as can be produced with any outfit. This camera has been recently introduced in a news model. This model is the same as the professional model, but is adapted for straight

cinematography only. It costs three hundred dollars. With the professional focusing rods and other refinements, the news model sells for four hundred dollars. Many news men in the past have purchased the professional model at fifteen hundred dollars, so the new models, which will produce the same high grade film, will be welcomed by the news fraternity.

Some years ago the Bell & Howell cine-camera was introduced and rapidly rose to the peak of popular approval. This is the camera which is used in making the great majority of professional motion pictures and is regarded as the standard of perfection in cine-cameras. It will be remembered, that in days past, when film stock was purchased plain and perforated by the user, that the perforations were made to conform to the Bell & Howell standard. This firm also makes other standard cinemachinery, including perforaters, splicers, printers, polishers and so forth, all of the highest professional quality and incidentally selling at strictly professional prices.

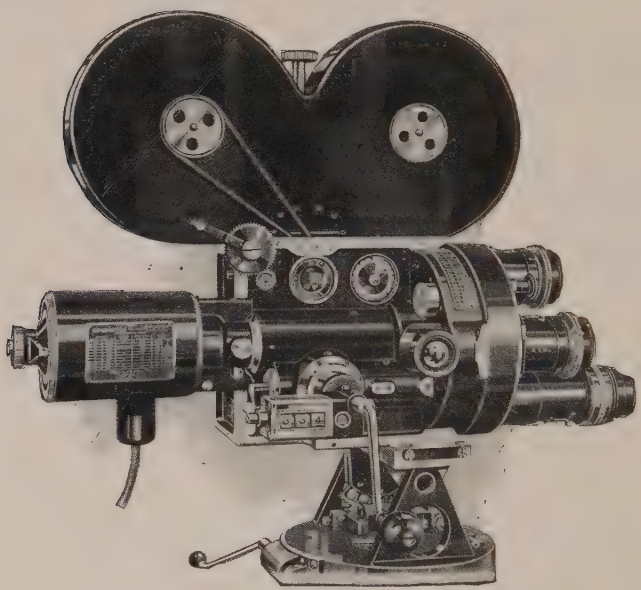
The Bell & Howell camera is a "unit" outfit. That is, the purchaser buys the component parts best suited to his work and pays for only those parts necessary to his work. The camera sells for twelve hundred dollars. This consists of the camera case, shutter, dissolve mechanism, shuttle, turret and turret plate. The camera is utterly useless without the accessories which include: magazines, lenses, finder, footage meter, hand dissolve and so forth. The minimum operating equipment is usually thought of as the following: Camera, 50 mm. photographic lens, 50 mm. finder lens, finder, film

meter, one double magazine, focusing glass and tripod, with cases for the complete camera. This equipment sells for approximately two thousand dollars. The usual professional equipment includes the Goerz effects, a 75 mm. photographic and finder lens and a 100 mm. photographic lens, the 50 mm. finder lens serving as a 100 mm. finder lens, having a square engraved on the ground glass to serve as a guide, a prism focusing glass, a focusing microscope, the hand dissolve, range finder mounting for the finder, an auxiliary aperture plate for exact trick work and four extra magazines. The complete outfit, with lenses mounted in micrometer mounts will cost between three thousand and thirty-five hundred dollars. A high speed mechanism for slow motion work is supplied for seven hundred and fifty dollars additional.

This camera is an unusual looking affair, and to the uninitiated looks like anything but a camera. The most distinctive feature is the large double magazine, which locks on the top of the camera and holds four hundred feet of film.

The camera is of all metal construction and is constructed with the accuracy of a watch. The camera is fastened to the tripod by a dove-tailed projection which permits it to slide from side to side freely, yet remain at any position by virtue of a clamp which is easily released by one finger while mounting or demounting the camera. The camera has a turret plate on the front which carries four lenses at one time, and by releasing a catch-pin, any one may be revolved to position in front of the photographic aperture.

The shutter is large, measuring about six inches in diameter, machined from a comparatively heavy plate. This shutter is accurately balanced and acts as a balance wheel for the entire mechanism. It is of double construction, embodying the automatic shutter dissolve. The dissolve is thrown into action by pressure upon a small lever. When the fade-out is complete, a brake is thrown on automatically stopping the camera. Pres-



The Bell & Howell Professional Camera

sure upon a small button releases the brake and any desired amount of film may be wound into the magazines with the shutter closed. Of course, in operating the fade-in the action continues uninterruptedly from the opening of the shutter. The camera may be locked

manually by revolving a milled ring which surrounds the shutter aperture dial.

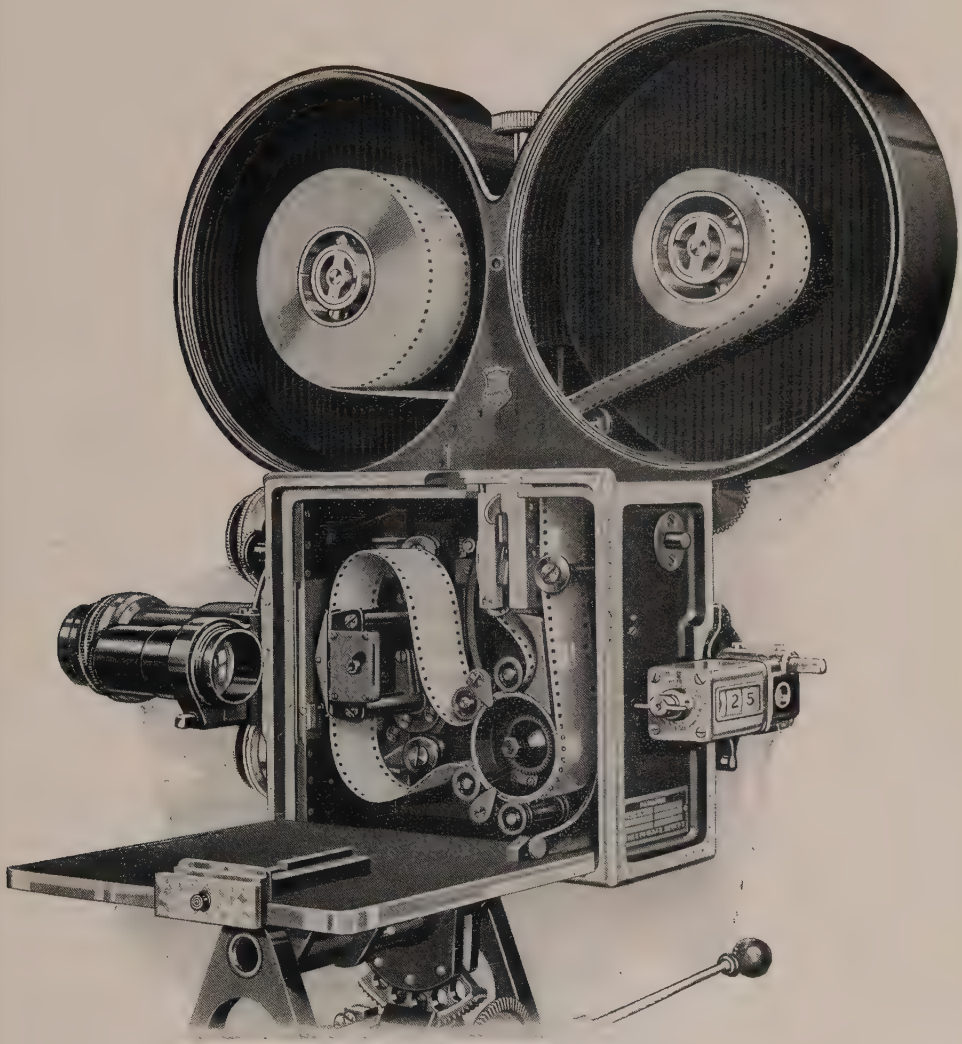
There are two film meters provided. One a dial with manual reset pointer is used to record footage of each individual scene which is used when such records are required by the producer. The other is a Veeder counter which records both feet and individual frames. This last feature is invaluable in trick work.

The take-up is of the spring belt type and as it operates in view of the operator, a constant check upon the take-up is possible. In filling the magazine, the film must be rewound so that the emulsion side is on the outside of the roll. The spools are about twice the diameter of the original wooden spool upon which the film is wound at the factory. I have known cinematographers who pulled a strip of film from the center of the roll until a hole was obtained which was large enough to slip over this spool, then by crossing the belt the film could be used without rewinding. This saves time, but wastes a great deal of film.

The shuttle mechanism is a wonderful piece of mechanism. The pins are accurately ground and are said to fit the perforation of the film to within a ten-thousandth of an inch. There are two pins, known as registering pins, which point backward and are fixed in position. These pins engage perforations at the top of the film. Then there are two other pins which move with the shuttle and actuate the film. The entire aperture plate moves backward, the moving pins move into the film and engage the perforations and pull the film down one frame, then the aperture plate, or more

properly the gate moves forward, the fixed registering pins engage the perforations and the gate carrying the film is clamped firmly against the main aperture plate. The shutter then opens while the shuttle carrying the pins moves backward, upward and inward. Then the shutter closes and the process is repeated. The two registering pins ensure absolute accuracy in register of the film, no matter how many multiple exposures are made. The only thing which would render register inaccurate would be the mutilation of the perforation itself, and as there is no pull upon the registering pins, so accurate is the movement, this will not happen ordinarily.

The problem of focusing the motion picture lens is a difficult one. The finest possible accuracy must be obtained and this is very difficult. Some cameras have ground glass plates which swing into the aperture, but this necessitates fogging or cutting the film or both. Others punch a hole in the film so that a portion of the image falls upon a ground glass behind the film, yet this throws the focus out an amount equal to the thickness of the film and this is undesirable. Others focus upon the emulsion, but the emulsion is only translucent at best, so that fine focusing is difficult. The Bell & Howell camera focuses by a unique system. The photographic aperture is at the left of the operator and the photograph lens should be at the left of the turret. When it is desired to focus the camera the turret is released and revolved until the lens is at the right side of the turret. The camera is now moved to the left side of the tripod, and the lens is



Interior of the Bell & Howell

focused upon the ground glass focusing screen which is fixed in the focal plane. When the lens is focused, the lens is again revolved to the photographing position at the *left* of the turret, and the camera is moved to the extreme *right* of the tripod. The lens is now in exactly the same position in regard to the field which it occupied while focusing, so that the focusing field is identical with the photographic field. Thus the camera may be focused at any time without disturbing the film in any way.

There are two other features which are used in ultra fine work. Just above the usual focusing aperture is an auxiliary focusing aperture which takes a focusing microscope. This enlarges the image and focuses by aerial focus. This means that the image instead of being rendered visible by projection upon a ground glass, which no matter how fine has some grain, it is projected in air or in space, and is rendered visible by an optical system, just as the image projected by the objective of a compound microscope is rendered visible by the optical system of the ocular. This, of course, renders possible a focus much finer than can be obtained upon any grained surface. The second device is the micrometer lens mount. For ultra fine focusing, all the possible illumination is desired, so the diaphragm must be opened to full aperture and as the focus of any lens changes to some extent with various apertures, the focus, when obtained would be thrown out by setting the diaphragm. With the micrometer mount, the lens is focused at full aperture and then, when setting the diaphragm, the mount automatically

compensates for the change. It must be understood that the change in focus by stopping down is so slight, that it would not be noticeable in contact prints or paper enlargements, and is so delicate that the inexperienced amateur could not discern it in focusing, so that the skill of the cinematographer is tried to the utmost in this ultra-fine focusing.

A bracket is furnished which attaches to the Bell & Howell tripod to support the trick "effects" so that there is no weight whatsoever on the camera or lens mount.

The magazines of the Bell & Howell camera are of the double type. That is, each magazine has two chambers, retort and receiver. These chambers are fixed and not interchangeable. The retort is filled with the unexposed film, the film lead out through the throat, into the receiver throat and fastened to the receiver spindle. The covers are then screwed into place and the magazine is ready for service. When about to load the film, a loop is pulled from the retort, leaving both ends of the film attached to their respective spindles, and the camera threaded. These magazines have a light-proof door which is closed tightly upon the film in each throat. When the camera door is closed a projection on the door presses a lever which opens these doors, so that in operation there is no pressure whatever upon the film. In operating the Bell & Howell camera, there is no pressure or friction whatever upon the emulsion side of the film at any time while it is in motion.

I have used the word "effects" as a noun at various

times and I shall now briefly describe these devices. First, there is some kind of support which varies with various cameras which serves to keep the axis of the effects in line with the optical axis. Then there is a revolving support fixed to this which permits the devices, as a whole, to be revolved about this axis. Upon these supports rest the effects themselves. First, there is the iris. This is a large iris diaphragm operated directly by lever or indirectly by crank and gears, but in any case, manually operated. When closed this causes a circle in a black background to be projected upon the screen. This circle grows smaller until the picture is blotted from the screen. The circle usually terminates at the center of the screen, but it may be shifted so that the operator may iris-out on any character in any portion of the screen. This device is sometimes used in place of the fades, and in scenics it is most effective.

Then there is the double exposure device. This consists of a frame carrying two opaque leaves which open from and close toward the center and may be used vertically or horizontally. It is sometimes, but rarely, used as the iris is used, to open and close upon a scene. More often the lever is disconnected so that each half can be opened or closed independently of the other. Thus either half of the film may be exposed. Used in this way it is analogous to the old and familiar duplicator used on still cameras for double exposure work.

The square closing dissolve gives the same effect on the screen as the iris, but the opening is square instead of round. More properly speaking, it is rectangular

with proportions relative to the proportions of the frame, that is 3:4. It is made like the double exposure device, but the leaves instead of meeting, cross each other, and the edges have an angle cut in them. The device is set obliquely in front of the lens, so that one long side of the opening is parallel to the bottom of the exposure aperture. When the lever is moved, both leaves move toward each other, closing the square from all four sides.

The multiple exposure device is similar to the double exposure device, but it has interchangeable leaves with apertures which vary in size and shape so that any portion or portions of the film may be exposed successively.

These devices are known collectively as effects and those described are the original Goerz effects. There are now numerous complex irises and other effects upon the market, but they all follow the basic design of the Goerz effects.

The shadow box is sometimes included in the effects. This is in reality a filter holder, and serves to support the various filters used in cinematography. The filters are used for graduated rather than for orthochromatic effects. An iris may be obtained with amber instead of opaque leaves which is used in the same manner as a filter, holding back, but not obliterating the edges of the picture. The shadow box is also used to hold diffused edge masks when the proper shape cannot be obtained by the multiple exposure device. So to mask out a circle within the borders of the frame, a glass is used with an opaque spot painted upon it. It is also used to block out doorways and other irregularly shaped portions of the picture.

The use of the various effects adds a great deal to any picture and it is the facility with which they may be used in multiple exposure work which makes the professional cameras so much more expensive than the amateur models. A camera costing only two or three hundred dollars can be made to produce as good film for general use, in straight cinematography, as that exposed in the best of professional cameras. Trick work, and scientific work requiring fine focusing and kindred types of work are the ones which require the high-grade camera.

Chapter V.

THE MOTION PICTURE CAMERA IN USE

THE first thing to do after purchasing the camera is to master the cranking. It appears to be very simple to set up the camera and turn a crank. The professional cinematographer seems to watch everything else around him but his crank, and so he does! He has cranked so many thousand turns that it is second nature to him to crank steadily and uniformly at proper speed, that even under the stress of the utmost excitement, when he is hardly able to control himself otherwise, his hand will continue the same steady grind, but it takes many weary hours of conscientious practice to acquire this facility.

A careful consideration of the laws underlying the mechanical portion of the science of cinematography will help the amateur to understand the great importance of correct cranking. It is really so important that unless it is mastered, success of any degree in cinematography will be impossible!

In normal motion film, sixteen frames are exposed each second, each being a photograph of the action

A knowledge of photography is essential to learning cinematography, but the hit and miss knowledge of the "Snap-shooter" is not sufficient. As this work is limited to a single volume it is obvious that there is no room for a full treatise upon photographic technique. For such of my readers as are not competent photographers I suggest a careful study of some photographic text-book. One of the best I know of is French's "PHOTOGRAPHY FOR THE AMATEUR," Falk Publishing Co., N. Y.

taking place during an interval of one thirty-second of a second or less, but whatever the interval may be it is the same in each frame. It is also well known, universally known among amateurs, that the duration of the exposure is the vital factor in the determination of exposure, and that an exposure greater or less than normal will mean an incorrect exposure.

Probably the best course to pursue is to consider each error by itself, and the sum of don'ts will clearly indicate the necessary "do's". First let us consider the effect of slow cranking, and in order to illustrate clearly the effects obtained we shall consider greatly exaggerated faults, but it must be borne in mind that any amount of error, no matter how small, will produce its corresponding fault to a like degree, and only when that degree is so small that it is no longer apparent, is the cranking passably good.

To return to slow cranking: Let us suppose that an actor makes a sweeping gesture which occupies five seconds of time. With normal cranking this will require eighty frames for its registration. When projected, eighty frames will pass through the projector in five seconds, and the action will be normal. Now suppose that the cinematographer cranked only half as fast as usual. Then this action would be registered in forty frames, and when these forty frames pass through the projector, they will consume two and one-half seconds of time, or in other words the action will be accelerated by one hundred per cent. You have seen this effect in the style of comedy which has been discarded for some time. That was, those in

which all moving objects darted about the screen so rapidly that the eye could hardly follow them. To obtain this effect the camera was at times cranked as slowly as one-quarter speed.

Now let us consider the error of cranking too rapidly. Using the same five-second gesture for illustration, suppose that the camera were cranked at double speed. One hundred and sixty frames would be used in the registration of this movement, and when projected these frames would consume ten seconds in passing through the machine and the movement would be just twice as slow as in life. This is the principle of slow-motion and motion analysis pictures which most of us have witnessed. There are cameras of the usual portable type which will expose from two hundred and fifty to three hundred and sixty frames per second or up to twenty-two and a half times normal speed. These cameras, however, are provided with special intermittent movements. It is inadvisable to use the usual type of camera even at double speed, as the film is practically certain to strip and injury to the shuttle is very probable.

It will be seen from the foregoing that the change in speed is directly opposite the change in effect, that is a slow crank gives a fast picture and a fast crank gives a slow picture, but if the film is projected at the same speed as that at which the picture was made, the action will appear normal. This leads us to a more fatal error, one which cannot be remedied by projection at any speed. This is non-uniform cranking.

When turning any crank in a plane perpendicular

to the plane of the body it is natural to exert more force on the outward and downward thrust than on the inward and upward pull. This means that in making a motiograph that four frames will be made at a fast speed and the next four at a slow speed. In addition to making the projected action alternately slow and fast, this kind of cranking will also alternately overexpose and underexpose the film. Now disregarding the acceleration and slowing, let us see what the result will be at merely fast and slow speeds. We will use the same illustration as before.

For one-fourth of a second the arm will move slowly and the film will be overexposed, and the screen show light, then for the same time the arm will move rapidly and the film will be underexposed. The combined action will be jerky, and as any movement lasting longer than one-sixteenth of a second is perceptible to the eye, the lightening and darkening of the screen four times a second will be very painful to view. In addition, the difference in detail of under- and overexposed film gives a curious illusion of the objects on the screen advancing and retreating. All in all, such a film is utterly worthless and no attempt should be made to save it.

This fault is one which will be found, almost without exception, in films made by an amateur who has not taken the trouble to master cranking before attempting to fill the camera and actually expose film. Examine your camera and be sure, first of all, that you thoroughly understand the mechanical action of the various parts. You may be able to learn to operate an

automobile without knowing more of its mechanism than the location of the gasoline tank, but as there are as yet no cine-camera garages, it is essential that you *know* your camera before trying to operate it. When you are thoroughly familiar with each part and understand its function, set the tripod and camera up just as though you were going to make a motiograph, but leave the magazines empty. Now start cranking, and try as much as possible to keep the motion uniform. Crank thirty times or less to the minute if that will help, but keep at it until a uniformity of speed is attained at a reasonably slow speed. Remember that a uniformly slow speed will produce a usable film while non-uniform cranking will not. Passable uniformity has been attained in an hour's practice, but some operators never do acquire it. The time required depends entirely upon the individual. As a rule, the older the amateur, the more difficult is this operation. For middle-aged and elderly persons who wish to enter this fascinating field, the automatic cameras, such as the Sept in standard gauge or the Bell & Howell Automatic in the sixteen millimeter gauge, are strongly recommended.

When uniformity has been attained, learn to crank at the right speed. This speed is almost universally two turns per second. First you must learn to count seconds with fair accuracy. Look at your watch and when the second hand indicates the beginning of a minute, close the watch and count out loud, as rapidly as the words can be clearly enunciated, "One hundred and one, one hundred and two" and so on to twelve,

then count deliberately, but not slowly, "Thir-teen, Four-teen" and so on. When you have reached sixty, look at the watch. Then try again, counting more slowly or more rapidly than before, according to whether you counted more or less than one minute. When you can count seconds so accurately that you will not vary more than two seconds either way in a minute, begin cranking. The crank goes down on "One" of "One hundred" and also on the number denoting the unit. It also goes down on "Thir" and on "Teen," making two complete revolutions each second. If you have learned the tricks of uniform cranking and of counting seconds, the cranking will soon become second nature. Continue until you can crank correctly judging the speed by cadence rather than actual counting, then continue practice until you can crank correctly and at the same time observe the various actions taking place before your lens, and until you can concentrate on other things. This is necessary, for you will have to be your own director, and cranking must be a matter of habit rather than one of conscious thought.

When you are proficient in cranking, the first great step is past. This should take a week or more. Now learn to thread your camera properly. Upon this depends the smooth running of your camera. However, this is simple and a little care is all that is necessary. Draw out a foot or so of film, making sure that the film has been placed in the magazine in such manner that the film when passed through the shuttle has the emulsion side next the lens. If it does not do this when

threaded with loops as directed by the manufacturer of the camera, do not try to remedy it by twisting the film! In this case, the film must be removed from the magazine and the reel reversed. Now draw the film through the gate with the emulsion next to the lens, just as in small cameras the film is loaded with the emulsion facing the lens. In still work, destined for contact printing the diffusion of rays passing through the celluloid base would produce a usable film, but in motion work, the degree of enlargement is so great in projecting that the image must be needle sharp, and this small amount of diffusion would be disastrous.

Now look to the loops. These must be of proper size. That is they must be small enough that the emulsion will not be slapped against the inside of the camera box during the violent vibration originating in the intermittent movement; but at the same time, the loop must be large enough to provide such an amount of slack that the shuttle will not take it all up and drag against the feed sprocket. This would result in strain on the mechanism and the perforations of the film would be ripped out, and in a claw movement the claws would probably be bent enough to cause improper feeding and a "jumpy" picture on the screen.

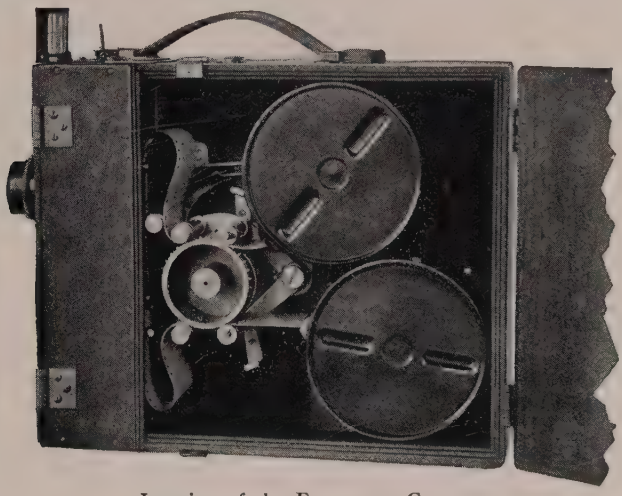
It must be remembered that the film while passing through the camera has two distinct motions. The film is pulled from the retort magazine by a sprocket which revolves with a constant uniform motion. This sprocket feeds the film into the upper loop or "slack." Then the intermittent jerks the film from this loop a frame at a time, feeding a frame into the lower loop every

time it takes one from the upper loop. Just in front of the receiving magazine is another sprocket synchronized with the upper, and revolving with the same uniform movement. In the later and better models, these two sprockets have been replaced by a single feed sprocket, connected directly to the crankshaft. In this type of mechanism the upper side of this large

Interior of the Cine-Kodak

sprocket pulls the film from the retort while the lower side feeds from the lower loop into the receiving magazine. The use of a single sprocket renders it impossible for the two feeds to become dis-synchronized. Reference to the interior view of the Cine-Kodak as published herewith, illustrates this principle. The interior view of the Ernemann camera illustrates this principle also, and perhaps a little clearer. Now trace the move-

ment in the illustration. First notice the large circular box in the upper part of the camera. This is the retort magazine. Issuing from a slot near the bottom of the retort is the film which passes over the upper surface of the large feed sprocket. On the opposite side of the camera, the crank is connected directly to this sprocket. From this it passes into the upper loop. Reference to the illustration will show why this slack



Interior of the Ernemann Camera

is called a loop. From this the film is seen to pass behind a plate of metal which is called the gate. This gate swings open just like a gate in a fence. Directly behind the aperture through which the light rays pass to expose the film, the gate carries an auxiliary plate which is held against the film by springs. This is the pressure plate or pressure pad, and serves to hold the film firmly in contact with the aperture, and conse-

quently in the exact focal plane during exposure. In cheaper cameras this plate has a constant pressure, and care must be taken to see that it is always clean and bright, for any foreign particles would scratch the soft emulsion and streak the film. More expensive cameras have a "release plate" which places the film under pressure only while it is not in motion, thus obviating all chances of scratching. From the gate the film passes into the lower loop, being pulled through the gate by the claws of the intermittent which usually act through vertical slots cut through the margins of the gate. From the lower loop it passes over the under side of the sprocket, and the spindle turning in the receiving magazine takes up all slack from the feed sprocket. Bear in mind that this complete cycle recurs sixteen times every second. For such precise and rapid operation the mechanism must of necessity be somewhat delicate so that you must be sure that all is in perfect condition before attempting to operate the camera. Otherwise you will endanger your equipment. See that the claws fit properly into the perforations and do not strike the film between the perforations. See that there is no dirt, film shreds or other foreign matter anywhere inside the camera. See that no dirt is lodged in any dark corners.

There is one point which must be watched. As the spindle in the receiving magazine winds the film, the diameter of the active spindle constantly increases. The wooden spindle usually used will take up approximately two inches at each revolution, but when nearly two hundred feet of film is wound upon it it will take

up nearly a foot, and this spindle feeds from the sprocket which revolves at a uniform speed. It is evident that some adjustable feed must be used. This is usually accomplished with a spring belt which slips on its pulley, yet keeps the film tight at all times. Other cameras act by spring clutches. This adjustment is usually made by the manufacturer, but the expert cinematographer always makes sure his take-up is working properly before closing his camera, and he does this each time he inserts a fresh magazine. This is done by turning the crank very slowly a turn or two. If the feed, intermittent and take-up are all working properly the film will move through the mechanism smoothly with practically no effort, and you are ready to make your motiograph.

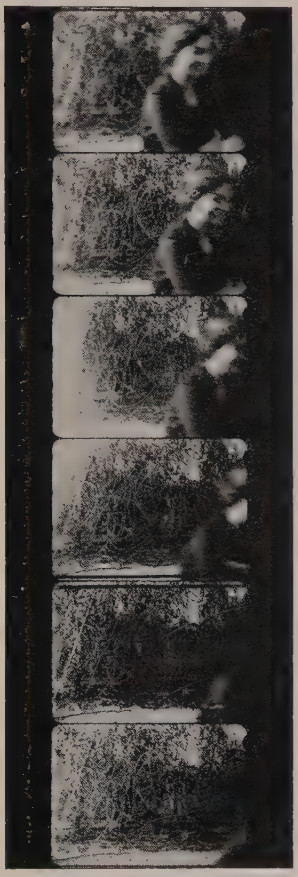
For your first subject choose one which does not move too rapidly, one which will not necessitate moving the camera while cranking and one which is so well lighted that a stop of f 11 or smaller may be used. This will make for success in your first effort. You can then try more difficult subjects as you become proficient.

The exposure, as such, is regulated in motion work by the size of the diaphragm aperture. It is true that some cameras have adjustable shutters, but this is for a different use as will be described later. This makes the calculation of exposure far more simple than when a sliding scale of the relation between shutter speed and diaphragm opening has to be considered. The motion picture film must possess the utmost possible sharpness, hence the smallest possible opening should

be used. Again, contrary to still practice, the absolute stopping of motion is not entirely necessary. The human eye does not register a sharp image of moving objects. As before mentioned, continuity of vision makes us see during an appreciable instant of time all that has occurred during the preceding one-sixteenth of a second, therefore, considerable blurring of the image of a moving object is permissible providing that all fixed objects are perfectly sharp and clear. As long as the cranking speed is maintained, it is nearly impossible to obtain pictures of ordinary objects so badly blurred *by motion* that this is noticeable on the screen as a defect. Of course, this rule is subject to limitations which will be discussed in connection with the shutter angle. A speed of one-fortieth of a second, which is the approximate exposure of amateur cameras, is fast enough for all ordinary work.

Before making exposures it is well to remember that motion picture film is coated with an emulsion which is rather more than usually sensitive, that the shutter, by virtue of its design, acts with the efficiency of a focal plane shutter and that the extremely small size of the lens results in less absorption of the light rays than is the case with larger and thicker objectives. Bearing this in mind it will be found that a maximum opening of f 11 is ample for most well-lighted outdoor scenes. However, a good cinematograph exposure meter is an essential part of the cinematographer's equipment and is even more valuable than in still work. Get one before you start to work. It will more than save its cost on your first subject.

Also, remember that the negative is not to be printed on paper, but is to be printed as a transparency on motion picture positive stock, and that this comes in



This plate made from a strip of actual motion-picture film (negative), illustrates the amount of blurring made by a rapidly moving subject. Owing to the fact that the eye, when observing rapidly moving objects, does not form a sharp image, this picture, when projected, will look natural. The two black lines between the fourth and fifth frames indicate the cut used on rapidly moving, exciting subjects which serves to increase the tempo of the film.

but one speed and one degree of contrast. It is common knowledge among photographers that only negatives of the highest degree of technical excellence will give good transparencies. The one control in printing motion pictures, is the regulation in some manner of the amount of light which falls upon the film in a given interval of time. Imagine having to produce a negative which will make an acceptable lantern slide, and which must be printed upon a given grade of lantern slide plate and you will understand the kind of negative which must be obtained upon your motion film. *It must be good!* This may sound discouraging to many of my amateur readers, but the work will prove to be the best training imaginable for those who have, heretofore, guessed at the correct exposure and let the photo-finisher do his best to obtain a presentable print from the resulting poor negative.

Exposure may be varied, as I have explained, in some cameras, by varying the shutter opening. Such cameras have two shutter blades, one fixed to the shaft and the other revolving about it in such a manner that a sector-shaped opening may be obtained, embracing any desired angle from the maximum opening to entirely closed. Such cameras usually have a maximum opening of 170 degrees. When this auxiliary blade can be closed gradually by automatic mechanism, we have the automatic dissolve which is a feature of professional cameras. Some professional models accomplish the dissolve by closing the diaphragm. In using the adjustable shutter, the speed is calculated in this manner: Estimate the proportion of the opening to the

whole shutter and divide sixteen by this. Thus, if one-fourth is open, divide sixteen by one-fourth and the result is sixty-four. Exposure, one sixty-fourth of one second. However, the shutter opening is not changed to compensate for existing light conditions, for when the speed of the subject will admit, the full shutter opening should always be used. The shutter is only closed when photographing subjects whose speed is such that were they to be photographed with full opening the amount of blur would exceed the permissible maximum. Thus, a broadside of an express train or a racing automobile would require a ten degree opening or less, providing the light was strong enough to permit this.

Although the shutter is not altered to compensate for light conditions, a smaller opening does cut down the amount of light admitted to the film and all exposure calculations must take this into account. However, if you possess a camera with an adjustable shutter, I should not recommend such subjects until you are thoroughly familiar with your instrument and its capabilities.

The motiograph requires its own style of lighting. The owner of the small box camera constantly exclaims:

"Get out into the sun so I can snap you!"

The advanced amateur smiles contemptuously at this and usually says:

"I will try an exposure at night, if you like; but as for brilliant sunlight—no, thank you!"

Both are right, considering the limitations of each

and the eventual result desired, and in motion work, a little must be taken from each point of view.

We hear much of "Record" versus "Picture." The motion picture is essentially a record. It is true that professional producers with unlimited time, equipment and capital available, have produced motiographs of some artistic value—and more have tried and failed. Also some scenics have been made which vie with salon pictures in sheer beauty; but the scenic motiograph begs the question in that the idea of motion is either absent or suppressed. A little thought will show that the movement of the principals in a dramatic motiograph renders impossible anything more than the most elementary attempts at line composition, and in the same way renders useless most efforts toward orthodox artistic lighting effects, so that the goal of the beginner should be a needle-sharp, brilliantly lighted subject, but one which is not harshly lighted. Now, I can actually hear the host of advanced amateurs rising and shouting, "Brilliant, sun-lighted photography without harshness—how?" The answer is "Reflectors."

We are all familiar with the use of reflectors in indoor work, and we realize their great value in such work, but how many of my readers have used reflectors in photographing a subject lighted by direct, summer sunlight? Very few, I will wager. The professional cinematographer, however, would start on location as readily without his camera as without his reflectors. The usual method is to obtain an oblique, somewhat less than quartering, side-light direct from the sun upon the subject, and then lighten the dark side by the use of reflectors.

The professional reflectors are heavy and sturdy, and incidentally there are men in the crew whose special duty is to handle these unwieldy objects, but for amateur use a light and efficient reflector can be made as follows: Cut two pieces of beaverboard two feet by four. Lay these with the smooth sides facing and along one long edge glue a strong binding strip of canvas. When this is dry the affair can be opened like a huge chessboard and will present a surface four feet square. This surface is now painted with a flat white kalsomine paint. Water color is used so that the surface can be often renewed, easily and cheaply. This is known as a soft reflector and is the one most often used. It reflects a soft, diffused light which used on the dark side of a sunlighted subject will render all detail visible without having to overexpose the bright side, yet a light which will retain all of the modeling of the subject.

In using the reflectors, these are set and the exposure calculated for the lighted subject. The result will be a film of snappy quality, yet with the harshness greatly relieved, the subject perfectly clear in all detail and exposure correct. If the reflectors have been properly set, so that none of the background is illuminated, the subject will stand out with an approximation of stereoscopic relief and with true atmospheric effect, gained not by the suppression of focus in the background, but by the suppression of the lighting.

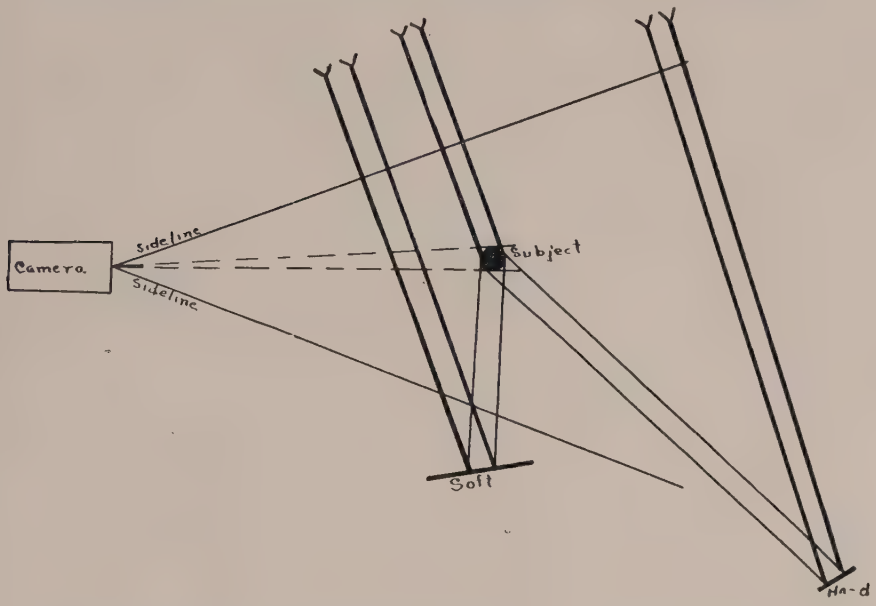
We have all noticed that of all forms of "one-eyed" photography, the motion picture has the most realistic relief, surpassing even the lantern slide in this respect.

This is not the result of chance, or of some obscure law of optics. It is the result of an incalculable amount of study and experimentation with lighting effects. The most successful device for producing relief by lighting, in common use, is the "hard" reflector. This may be either a beaverboard foundation covered with tinfoil for flood lighting, or a mirror for accenting. The tinfoil may be used with great success by the amateur in place of the mirror and is far more easily handled. No matter which is used, it should be not less than two feet square.

In use, the hard reflector is used to reflect the sun's rays in their full intensity upon the back of the subject. That is, the side away from the lens. Does this sound foolish? It is not so, you may be sure! It is but an adaptation of the backlighting so commonly used in the better class of portrait studios. It gives life and brilliancy to the hair and surrounds the figure with a faint aura. It is essentially a useful application of our old time enemy, halation. Note that this light is not considered in calculating the exposure, but is allowed to "burn up" the film wherever it strikes. For this reason, the hard reflector, *used by the amateur,* would probably prove disastrous, though it is used extensively by professionals.

The foregoing is analogous to the directions which accompany the little box camera. As the amateur advances in motion work he will find lighting a tool even more flexible than in still photography. He will have many, many failures—and will achieve many beautiful results. The subject of lighting has never been mas-

tered by anyone. However, in this elementary work I am only trying to get the beginner well started on the right path and nothing more, therefore, all rules I give are only basic, and all are possible of the utmost elaboration—and disregard—by the advanced amateur.



The Use of Reflectors. The subject is illuminated by the direct rays of the sun as shown by the heavy lines. Other rays from the sun strike the soft reflector which illuminates the shadow side of the subject, but less brilliantly than the light side. Still other sun-rays fall upon the hard reflector and are reflected upon the back of the subject, thus giving brilliant back lighting.

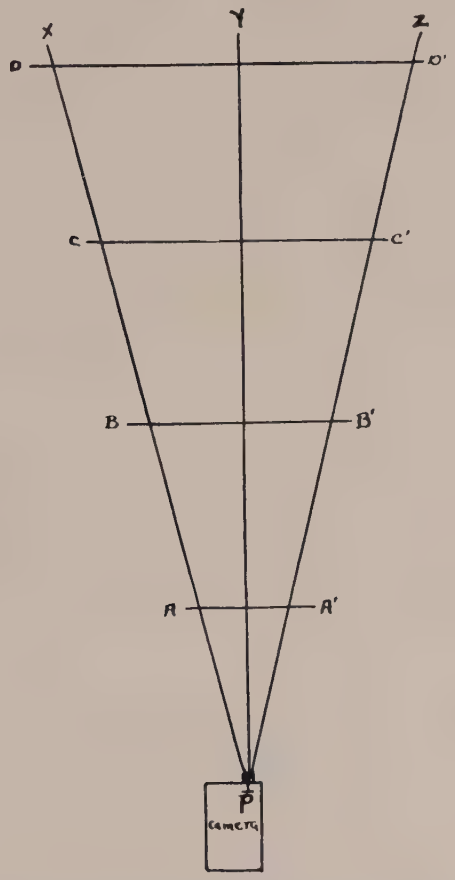
Such lighting as I have described will yield the best results for such beginners and as each progresses he will answer for himself the various questions of proper lighting as they come up. The professional will try, at least, to obtain a picture under any light conditions you may give him.

With a knowledge of cranking, threading and focusing and with the reflectors on the field, the cinematographer is ready for business. The matter of focusing and arrangement is about the same in still work, but care must be taken to obtain the finest focus possible, and to this end it is well to remember that even with many fine anastigmats, the focus varies with different diaphragm apertures, although to a degree which would not matter in negative making for contact printing. For this reason, if possible, always focus with the opening which is to be used. Many better grade cameras have micrometer lens mounts which automatically compensate for the diaphragm stop, when setting the lens. The lens is first focused wide open, and then as the diaphragm is set, the focus is changed to compensate.

The last thing to do is to establish the sidelines. In professional work, actual marks are now rarely used, but the amateur should use them until familiar with his work, and they should always be used when utilizing amateur actors, so they may know when they are included in the field of the lens.

While looking through the finder, or better, the focusing tube, have an assistant walk across the field of view, about ten feet distant from the lens. As he just enters the field of view, have him make a mark on the ground, then as he walks out of the field have that point marked also. Then repeat the process with the marker at a distance of thirty or forty feet. Now connect the points on each side. These two lines will enclose an angle whose apex lies just under the lens.

This is the angle of view of the lens and all action must take place within it or be lost to the camera. Now have the assistant begin at the camera and walk directly away until his feet come into view. Mark



The Field. Lines PX and PZ are the sidelines while PY is the center line. At A'A if the field is twenty feet across it will be forty feet across at B'B, sixty at C'C and eighty at D'D. These measurements are comparative only. The field is shown from above, looking down. P is the film lying in the focal plane. This diagram shows the necessity for sidelines.

this place for the front line. This is for full length action. In close-up work, of course, this is disregarded.

All is now ready for the actual exposure; but it is quite a trick to obtain a presentable picture. For this reason, a certain amount of rehearsal and direction is necessary, so these subjects will be discussed in the next chapter.

Chapter VI.

DIRECTION AND REHEARSAL

THE title of this chapter sounds very professional and difficult, but it is not so really. Rehearsal and direction are but convenient terms for actions which every amateur has performed time after time. When you work and work to get Baby to smile, that is nothing but direction on your part and rehearsal on the part of the infant. Every motiograph which is worth the celluloid upon which it is printed, is the result of a definite amount of direction and rehearsal. There is little to be said of rehearsal which is not covered by the simple rules of direction, for the two processes are different phases of the same process. Direction is a mental process, the physical application of which is rehearsal. The cinematographer who is his own director, tells his actors what to do. This is direction. The actors follow these instructions, and *this* is rehearsal.

When working with adults it is well to go through the action a few times, actually cranking the *empty* camera. This will accustom your actors to the novelty

The inevitable ambition of all good cinematographers seems to be that of securing a directorship, and, indeed, no better material can be found than that which exists in the ranks of successful cinematographers. If you desire to go farther into this subject than you can with the material in this brief chapter you should study "MOTION PICTURE DIRECTING," written by a critic and practical studio staff member, Peter Milne. Falk Publishing Co., N. Y.

of their positions and remove a certain amount of self-conscious stiffness. However, beware of too much rehearsal, for it will result in the stiffness of routine work. Thus, it is evident that a happy medium must be found. When working with children about all that can be done is to get the child into the right mood and then crank when the opportunity offers. This procedure is familiar to those photographers who are accustomed to Graflex work with children. The cinematography of wild life is an art in itself, and "direction" consists simply in knowing the habits of the creatures being photographed, and utilizing this knowledge to obtain such action as may be desired.

Direction is both an art and a science within itself. A successful director, whether he directs a photo-drama, an orchestra or a stage production, must combine two characteristics which are almost diametrically opposed. He must have the artistic sense developed to the utmost; and at the same time, he must ever keep cool and watch carefully the details of mechanics and technique. There are few rules which can be applied to direction, and these few are necessarily most elastic. It can be easily understood that direction by hard and fast rule would result in a photo-play of such mathematical inflexibility that it would serve only to produce the utmost boredom in the spectators.

You may well think that all of this has nothing to do with you and the production of a simple, domestic photo-drama; but on the contrary, it has everything to do with you. The intimate little home "shots" you will make will be immeasurably better and far more

interesting if a little thought is spent upon intelligent direction.

Before attempting direction, the art of cranking and camera manipulation must be mastered until all movements are made automatically and without conscious thought on your part, for all of your conscious energies will be necessary for direction. The position behind the camera, which you will occupy by virtue of being cinematographer as well as director, is the ideal position for direction for then you will see the same field of action which the camera sees. If you will observe all the photographs of great directors in action you will notice that they are usually near the camera, in fact, they will be found just beside it, or immediately in front of and just far enough below the lens to escape blocking the lens view. In the course of my professional experience, I have known directors who stated that they could direct from the sidelines or other remote positions; but such directors are found in small companies and in small companies they will stay, for the feat is beyond the powers of vizualization possessed by any but a truly superman. Unquestionably the position of the cinematographer is the ideal directing position. This will be realized by amateurs who have experimented with various viewpoints when photographing some scene or individual. A very slight, indeed, an almost imperceptible, change in the position of the lens will often produce startling changes in the appearance of the finished print. If you have not tried this, take a reflecting camera and look into the hood. *Swing* the camera from side to side. Objects in the

immediate foreground will cross the screen in the same direction in which the lens is moving, objects in the middle distance will move absolutely in the same direction, but relatively in the opposite direction, and objects in the background will move positively with the foreground but at a much slower rate. Now set the camera on a tripod, place yourself some feet to one side and with a notebook, sketch the relative positions of various objects within range of the lens as you think they will be rendered. Now go and look at your camera screen. Compare your sketch with the actual view. You will be amazed at the result. So, when you get your wife, or some friend to crank while you direct, remember to stay by the camera. *Never* go into the field of action and maul your actors around with your hands as though they were puppets. You will only get an abominable and unnatural stiffness. Tell them what you want done and let them do it. The interpretation of the actor may not be your interpretation, but you must remember that it is this very individuality and consequent variety in interpretation of action which gives that elusive personal quality to a photo-drama which makes for success. Direct action, suggest appropriate "business," but leave the details of interpretation to your actors. Remember that a superabundance of individuality is the characteristic which has placed our great screen stars at the top of their profession.

As for the rules of direction, "There hain't no sech animile." The mathematician has set rules. To the best of my knowledge, two and two have made four

ever since creation, but that is science. The rules of art are constantly transgressed to the infinite betterment of art, and directing is an art. How many of us remember the day when we bought our first simple box camera and read in the accompanying booklet such "rules" as: "Always have your subject brightly lighted," and "Never point your lens at the sun." These rules are excellent in their place, yet how many beautiful pictures have been produced by the transgression of these rules? This may seem to be a digression, but I cannot too strongly impress upon you that each of the following rules should carry the prefatory phrase, "When the action does not demand otherwise—" These rules are not arbitrary, but are the result of long experience of a generation of directors who have produced our professional photo-dramas. As they are primarily mechanical in origin, they are just as applicable to the home-playlet as to the most elaborate spectacle, in fact, more so, for the elaborate superfilm may at times demand the transgression of every rule mentioned here, but the home-film will usually abide by them.

Do not let your actors carry their hands or other objects between their faces and the lens. In the photo-drama the face is the center of interest. The facial expression must bear the burden of telling the story, supported by such pantomime as may be used. Thus, the alternate hiding and disclosing of the face comes to the spectators like a periodic and annoying interruption while reading. However, in photographing a coquette flirting with her fan, it would be absurd to

try to follow this rule. Also the grace of certain interpretative dances would be ruined by strict adherence to this rule. Neither should your actors thrust hatpins into their cigars in order to smoke without breaking the rule. A little thought will immediately show the necessity to ignore this rule.

Do not let one actor come between another actor and the lens any more than is vitally necessary. This requires a word of explanation. The supernumeraries, or the extras as they are more commonly called in motion picture work are not, strictly speaking, actors. Their true position is more exactly defined by the expression used by some directors to describe them collectively—"atmosphere." They fill out the scene just as do palm trees or steamer chairs. When the scene demands a crowd it would be absurd to film an empty set, but they are not actors and as such are to be absolutely disregarded in the above rule. The reason for the existence of this rule is aptly illustrated by the familiar story of the store-group photograph.

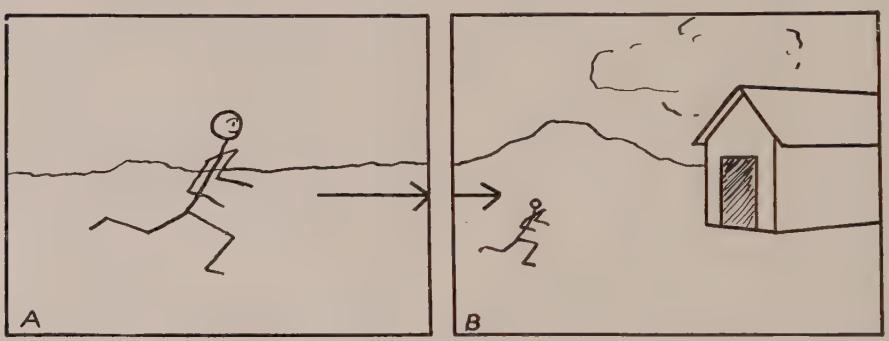
A large department store had a Circut photograph made of their employees. One diminutive cash girl carried her copy home and displayed it proudly to her mother. "See, mom," she said, "right here at this end is Sadie Milligan; then, see them legs just behind her? Well, that's me!"

So, in your motion work. Do not let any of your principals be so hidden that they have to be identified by "Them legs" or by any other detached portion of their anatomy. It will be thought naturally, using a typical example, that in making a motiograph of Baby

that Mother is merely an accessory, atmosphere in fact; but to have her face alternately obscured and disclosed is even more nerve-racking than to see a snap-shot of a pretty girl from whose head a fully matured oak tree is growing. Keep your principals working in opposition and clear of each other—except where the action demands otherwise. A love scene would decidedly lack punch if the principals kept clear of each other. I do not wish to make a bore of myself by constantly repeating, "When the action does not demand otherwise," but it has been my experience that amateurs—tyros, rather—find a constant alibi in the expression, "The book says thus and so and I did thus and so." Remember, knowledge is the tool of the master. He knows the reason for the rule; and therefore, knows when it should be broken. The best advice for the amateur who would be successful is this: Master your art!

Another test of the finished director is his ability to keep entrances and exits disentangled. They will prove most troublesome, and their apparent insignificance will but add to the difficulty, for until one film with scrambled entrances and exits has been made, the beginner in cinematography will very probably disregard them. Many otherwise good directors have to figure entrances or exits on paper, or have an assistant do it for them. One would naturally think that an actor could leave the screen at any desirable point and re-enter it at that spot which was the least obstructed; but owing to a psychological twist of our minds, and one by-the-way which makes photo-drama possible, we

are prone to follow the actor *while he is absent from the screen.* Should anything occur to disturb the direct continuity of this off-screen action we are vaguely disturbed and the resultant confusion of mind prevents a full enjoyment of the drama we are watching. To those to whom this subject is new, this sounds like sheer nonsense, yet careful thought and study of suc-



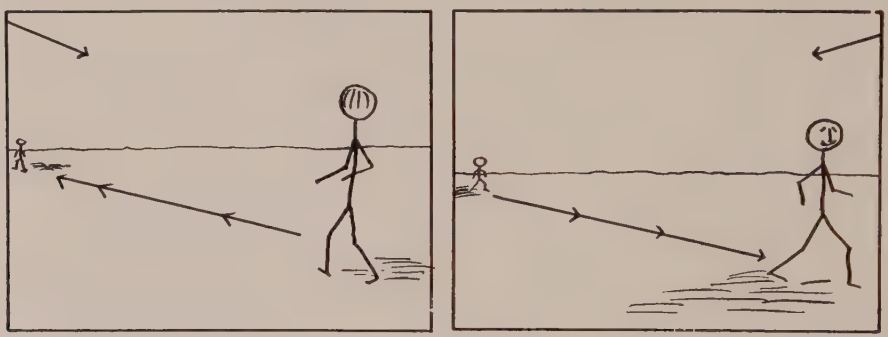
In the diagram "A" the actor is running across the screen and will exit at the right, his direction of movement being indicated by the arrow. In diagram "B" it will be noticed that the camera has been moved back and a much larger field included. This makes the image of the actor much smaller, but it will be noticed that he enters from the left and continues his movement toward the right, his goal evidently being the house. Thus, by placing two frames from successive scenes side by side it is easy to demonstrate the theory of continuity of movement.

cessful screen plays will demonstrate that some of the most important action, action in fact, upon which the whole story hangs sometimes, occurs *off the screen.* In describing the play to others we will include such incidents and many there are who would willing take oath that such action really appeared on the screen. This point leads to many heated arguments among theatre patrons in regard to past productions, for the

individual will interpret off-screen action in the terms of his individuality, and this provides a constant source of difference. If all minds worked alike, entrances and exits could be disregarded, but owing to the individual interpretation of off-screen action, the most direct course must be pursued in order that there will be the slightest possible ground for misinterpretation on the part of the spectator and the consequent resumption of screen action be effected with as little shock as possible. Our hero may go from New York to Hong Kong in the interval between two scenes, or in the home-drama, Bob may go from his nursery to the neighbor's kitchen. He may run in circles or turn hand-springs while on the screen; but for the preservation of good technique, have each entrance correspond with the preceding exit, and keep him going in a straight line off the screen.

To master this problem you must be able to visualize clearly the scene preceding the one upon which you are working. I do not mean the one which was made just before the one upon which you are working, but the one which will be shown upon the screen just before it, for scenes are not made in chronological order. Suppose that Bob leaves the nursery for the kitchen and leaves by a door at the left side of the room. We next go to the dining room and set up the camera in such a position that he will enter from the right, cross the screen and again leave at the left. Then to the kitchen and set up so that he will again enter from the right. Here he gets his cookie; and as this is a part of the dramatic action at his destination, he

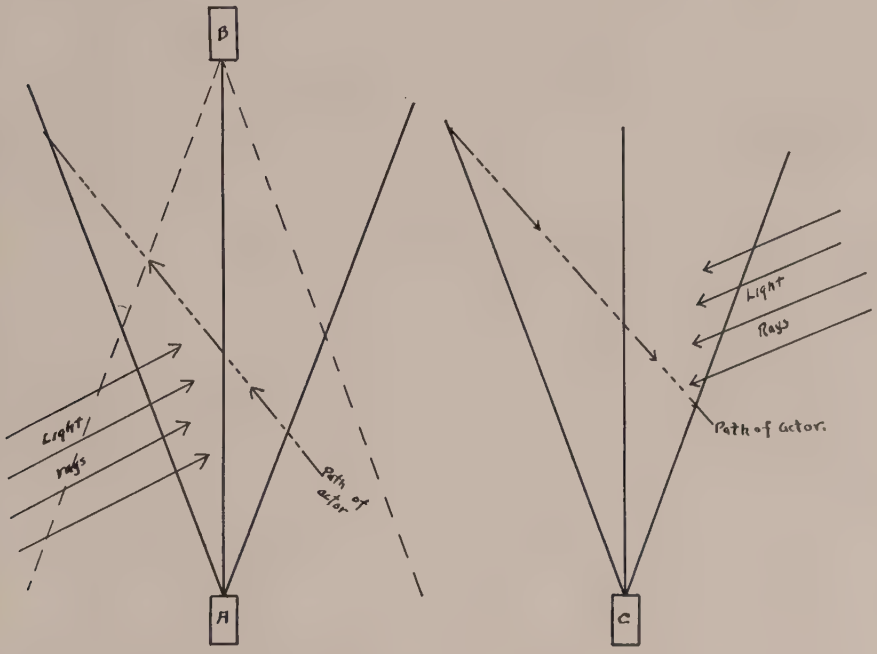
may go back and exit at the *right* on his way back to the nursery, and arriving there he will enter at the *left* by the same door used for an exit. This is a complete cycle of action. The entrances and exits are reversed, but only after action has been completed at the destination. The return journey is really another



In practice, the two frames must ,of course, be visualized as neither has yet been developed. Angular Exits and Reversal of the Point of View. Here we have an apparent disregard of the rule governing entrances and exits, but we have here an angular exit with a reversed point of view for the succeeding entrance. Note that although we have an apparent rupture of the continuity of motion, that in the first frame we see the actor's back while in the succeeding frame we see his face. Note also that the shadows are reversed as indicated by the light-ray arrows. Because it is most confusing in any case this practice should be avoided except when absolutely necessary for the development of the plot. The regular rule should be observed whenever possible. When the point of view is not reversed angular exits and entrances follow the rule. Do not try to reverse the point of view on broadside or straight exits and entrances.

sequence and entrances and exits are studied for it only, not for the complete cycle. Now suppose that we had set up in the dining room and made our motiograph with entrance and exit reversed. We should feel that Bob had been somewhere doing something unknown to us and was returning, for his direction is

reversed. Then if the kitchen shot followed, we should feel that the film was scrambled and the scenes joined out of their proper order, and our interest would be lost.



This diagram illustrates the field as used in making the scenes shown in Plate VI. At point "A" the camera is photographing the actor who follows the path indicated by the dot and dash arrows. The solid arrows indicate the path of light rays. The next "shot" will be to show the corresponding approach of the actor, or the scene as it would be "seen" by the camera were it placed at point "B." The second diagram of this plate shows the set-up for this shot with the camera at "C." Note the reversal of the direction of the light rays which cause a corresponding reversal of the shadows in the picture.

When Bob got his cookie, dramatic action was complete and he might on the contrary, have continued his walk and have gone out into the yard, in which case, although the dramatic action was complete, it was

only incidental, and the final action would take place in the yard after which the return would be effected. Try to imagine the result—and I hope you will never see it except in imagination—should Bob leave the screen at the left and in the next scene enter from the left! In technical phrase he is meeting himself. No matter how trivial this sounds in theory, it is most confusing in reality and will inevitably result in the loss of continuity of interest on the part of the spectator. Keep your actors moving in a straight line off the screen unless there is a very good reason for doing otherwise and be sure that if there is such reason that it is immediately apparent to your audience.

Another closely related subject is that of off-screen vision. I do not mean the supernatural, dream or trick-vision. I mean the registration of some scene or object which lies beyond the limits of the screen, but which is seen by some actor on the screen. That is not very clear. Let us suppose then—to return to our typical baby—that he begins to look frightened. The audience may imagine that he sees a toad or a lion; but if we flash upon the screen a few feet of a huge, gray gander with head and wings outspread, every spectator actually sees this creature rushing upon the baby and they know at once that baby is frightened by the bird. This, despite the fact that in reality the gander may have been photographed a thousand miles away from the baby or that the baby may have never seen such a creature. Your audience sees this action as plainly as though both baby and bird were upon the screen at the same time. For this reason it is advisable to set

up the camera so that if baby looks toward the left, the gander is shown rushing to the right. This gives the perfect illusion. An alternative method, used sometimes to create dramatic suspense is to place the camera in the position occupied by the actor and in this case the gander would appear rushing right into the lens. Could we temporarily acquire the mental processes of the baby, this would make a far more impressive scene than would the first method, but like all forceful elements in photo-drama, it must be handled properly and with the utmost attention to detail, otherwise it will not only fail to produce the desired effect, but will also ruin the continuity of interest. For home drama I strongly advise the first method. It is simpler, easier and produces the illusion of perfect continuity.

The illusion of coincidence may often be utilized for amusing and startling effects. Leaving baby for the time being, let us go forth and photograph a picnic of young people. They are all seated around the dinner cloth when Bob slyly tickles Mabel's neck with a straw. As a result she probably screams, jumps up and turns around. But, if Bob has been sly enough, there is no apparent reason for this particular bit of business when the picture is shown upon the screen. Then go forth into the woods and fields, or merely into the prosaic woodshed and get a few feet of a huge spider dangling from its gossamer thread. Insert this bit of film into the other, cutting just at the point where she gains her feet and whirls around, and the result will be convincing at least. Your spectators will afterward tell about seeing a picture of a picnic where a great nasty spider

dropped right on Mabel's shoulder. Never fear, they will see that which is not. In this work the matching of backgrounds must be carefully done, and the cutting must be exact as explained under the heading "Editing," but in all motion work, the utmost care is necessary. You will now realize that the director must understand the practical application of psychology. In speaking of motion pictures, an old quotation may be aptly paraphrased, "Illusion, illusion, all is illusion."

Your principal character, or pair of characters in the conventional love plot, must stand out strongly from the other actors. Not only must he not be crossed, but every device such as a contrasting costume, placing him as constantly in the foreground as is possible, and keeping his face constantly toward the camera, must be used to emphasize him. The successful photoplay is merely pantomime enacted by the principal and supported by minor leads and extras. You may not use these terms, but your home motiographs will be the same, or they will gather dust upon the shelves. Any dramatic theme must have continuity or be lost. This continuity rests upon the shoulders of the leading character. For this reason the suppression of this character means the suppression of the continuity—unless the specific action demands otherwise. All action, insofar as is practical, should take place behind this character. Do not let minor characters pass between him and the lens, or in studio parlance, do not let them cross the lead. Of course, this rule is subject to the force of circumstance. Suppose for example, that Mother is the star, supported by the children as minor leads

and Rover for atmosphere. Little Jimmy comes running in with a scratched finger and hastens to Mother for comfort. This is tense dramatic action. If he comes in unobtrusively from the rear, passing behind Mother he will appear before her before the spectators are well aware of his presence on the screen and all of the force of the incident will be lost; but if he comes in pell-mell from a position beside the camera and crosses Mother in his progress the audience is warned that something unusual has occurred and that a dramatic "punch" is coming. By the time he reaches her side they are all prepared for some action of importance. Even to those unfamiliar with the technique of the motion picture, it is at once apparent that any action important enough to warrant crossing the lead and temporarily obscuring all other action on the screen, is action of importance, indeed.

Another point of importance is that of tempo. Tempo, or the rapidity of action, has a marked effect upon the psychological effect of such action. You have all witnessed the tense crowds at a race, barely breathing as the horses come pounding across the line, and the hysterical outburst which marks the let-down after the finish of the race, yet who can imagine any such tense enthusiasm being exhibited at a snail race? Tempo is not amendable to strict rule; but it is usually a natural reaction. Briefly, all action should be somewhat quickened as climaxes are approached, and slowed down to correspond to the relief following the climax. Youth, joy, sport and kindred subjects require a quickened tempo, while domestic scenes, fire-side

scenes and idylls should be enacted with action slowed down. Avoid inappropriate action at all times. In real life people neither race to funerals nor walk with lagging steps to a fire.

Do not use unfinished action. This applies to action which has begun before the scene opens, as well as to that which is not completed at the close of the scene. If your actor is walking across the screen, do not open with him halfway across. If you use cross action at all, bring the actor into the scene after it has opened and continue it until he has left the screen. Of course, if the cross action is interrupted by dramatic action, as at the conclusion of a walk, the exit may be disregarded as it might well be inappropriate for the actor to leave the scene. For example, a scene might open empty and two lovers walk into the scene. Then if the dramatic climax is effected here it would be absurd to finish it and have the actors walk off the screen. The proper treatment is to fade out on the embrace. However, the rule applies to the straight cross action. It is also permissible to open on the actor when the action is oblique, that is if the actor is in the distance and advances into as well as across the screen. Owing to the perspective of the usual fifty millimeter lens the illusion of distance is well rendered. As the angle embraced is much greater than the angle of sharp vision of the eye, an object at a given distance is disproportionately small when compared with actual vision, and this makes an actual distance of a hundred yards or so appear to be much greater. For this reason, opening on an actor at the distant end of an oblique cross

walk does not jar as it does when he suddenly appears in the middle of the screen and calmly takes up a cross walk. Any scene which shows the progress of an actor from one point to another is termed a walk, no matter if he runs at headlong speed. So, cross walks are very useful in showing the progress of a journey, to establish the fact indisputably that the actor has embarked upon a journey or to show amusing or pertinent facts which occur during the journey. However, if you once begin to follow the actor on his journey, follow him throughout its length and show his arrival at his destination. For example, Johnny leaves the nursery and starts to the kitchen. Then, if you set up in the dining room and show him going through it you must also set up in the kitchen and show his arrival, otherwise you have left him hanging in space, perhaps to become a satellite of the earth, but whatever his ultimate destination, you have lost the continuity of interest of your audience. If, however, you merely omit the kitchen scene and photograph him upon his return, you have accomplished no purpose, you have him meeting himself and confusion results from the breaking of the rule of entrances and exits. If you don't want to go into the kitchen, wait until he is about to re-enter the nursery and then start your next scene. He will not meet himself in this case, even though he leaves and re-enters through the same door, for the nursery is the scene of action and a complete cycle of off-screen action has occured. He leaves action and exits. He returns and resumes action. Thus, it will be seen that the care necessary with entrances and exits

is usually applicable only to walks. The proper calculation of such action is based upon your everyday experience. You may leave a house by the front door, and later you may re-enter by the same door, all in the course of sane and reasonable action, but you seldom walk down the street, then abruptly back again without having reached any destination—unless you have forgotten something—and let me say here, if you should be photographing such a scene, be sure to photograph the sudden hesitation, the thought and the turning and starting back. Don't merely show your actor passing to meet himself, leaving your audience to surmise that he has forgotten something.

This subject of finished action is closely interrelated to that of entrances and exits, yet they are absolutely different. Indeed, some of my readers may think that finished action is that part of the work which sets at naught the rules of entrances and exits, and such is rather near the truth. Let each scene on the screen have definite purpose. Thus, walks show definite progress from one point to another and during its progress entrances and exits should comply with the rule but the beginning or termination of important action occurs in a scene which might be termed a focus of action, and in such all entrances and exits will be such as are the most natural for the action involved. Suppose your setting was a room, the door at the right opening outdoors and that at the left disclosed a bathroom. Through a window at the rear a beating rain may be seen. The hero dons a rubber coat and steps forth into the storm. It is reasonable and proper for him to

re-enter by the same door. If he were to re-enter by the door at the left, according to the rule of entrances, the spectators would not only wonder how he got into the bathroom, but they might also wonder at his unorthodox method of taking a shower. *If not otherwise demanded by the action* it is well, when an actor leaves a focus of action, for him to re-enter by the same door. It indicates a completed cycle, his absence causes no confusion, and his position is immediately identified. Upon reflection you will realize that when you leave the house or room upon one definite errand you usually return through the same door. This is in direct contradiction to the general rule governing entrances and exits, and may prove a bit confusing; but a little thought will show the reason for such contradiction. All of these rules only serve to smooth the way for the spectator. We live in the midst of drama, but it is obscured by the multitude of petty detail which fills our lives. The dramatist strips everyday life of such detail and making complexity simple he displays to our sight the pure gold of drama recovered from the dross of life. So remember, the simplest complete action is the best. A pertinent detail here and there helps the general atmosphere at times, but irrelevant detail must be suppressed.

Do not let your actors look into the lens of the camera. The screen often displays the most intimate action. Action which we should not commonly have the opportunity to observe in real life. The position of the spectator is analogous to that of the spy. He sees the most private action, but by a peculiar psy-

chological reaction, his personality is merged with that of one of the leading characters, so the impropriety of peeping is not felt. If, however, the actor looks into the lens, he looks directly into the eyes of each individual spectator in the audience. This breaks the illusion of merged personality and brings home the feeling of being caught in the act of spying upon the private life of our neighbors. Suppose you were watching a man through a powerful telescope so far distant from him that you know he cannot see you. You are perfectly comfortable as long as he looks away, but let him look directly at you and you will feel uncomfortable, even though you know he cannot distinguish you.

This rule is broken often, especially in the large studios where actors and actresses of proved ability are employed. It is also used by some news men in photographing figures of importance. In the studio it is most often used in connection with the closeup to register intense emotion, and in the resulting surge of emotion in the audience, the guilty feeling is lost. The newsman is photographing events of the most public nature, and if he can get a motiograph of the President looking directly into the lens he has obtained a film which when projected will give to each spectator a most delightful sense of intimacy with the head of our nation, for on the screen the President looks directly into the eyes of each spectator, and he feels that he has in a measure had a direct conversation with the chief executive. So, the rule may be transgressed in order to create a sympathetic reaction among the audience, but it is a dangerous business in drama, and I would advise the amateur to avoid it.

A volume could be filled with rules, but those given will serve to guide the way, and the fewer rules which can be used, the more artistic will be the result. Many directors have certain methods of procedure which are not observed by others, but these are idiosyncracies and to follow them would result in an imitation of the technique of that particular director, and as most imitations are, it would be a weak, washed-out thing.

It is best for the amateur cinematographer to start with a very few actors in his productions. Anyone familiar with any phase of camera work knows that the instant anyone sees a camera pointed at him, he begins to pose, consciously or otherwise. This is ruinous in motion work, and upon the shoulders of the cinematographer rests the responsibility of seeing that the action is at all times spontaneous, or at least, apparently so. This means, of course, that all actors must be watched constantly; and at the first hint of stiffness, be warned against it. For the beginner to try to make a motiograph with a dozen actors or so on the screen at one time, none of whom have ever had screen-acting experience, is to court disaster. The effort of trying to keep all of them acting smoothly will confuse the cinematographer. Then he will neglect some while trying to correct others, his resultant confusion will be transmitted to his cranking, and the camera had better be stopped. In this connection it might not be amiss to mention the length of scenes. It is apparent that the longer the action, the more difficult it is to keep all going smoothly. You may easily walk a dozen steps with an armload of boat oars on your shoulder,

but try to carry them a hundred yards and you will have trouble. The usual action outlined by the amateur will run from one to five minutes, dull, slow, monotonous and filled with superfluous detail. Boil it down! Retain only the meat of the scene! It is an unusually important scene, even in professional work which runs for a minute on the screen. I can count upon the fingers of one hand all of the times I have seen a professional scene of such length! Go to the theatre and time the scenes. You will be amazed to find the number of scenes of twenty, fifteen seconds, and less. Keep your motiograph "peppy." Just as verbosity ruins a story, so excess footage ruins a film. Remember that the bulk of the action takes place off the screen, in point of time at least, and you show only enough of the high-lights, so to speak, to enable the spectator to follow the continuity. When you go to the theatre, calculate the time covered by the story. The film will probably be in less than ten reels. In this case you have witnessed action in natural tempo, lasting two hours and forty minutes, yet the dramatic time elapsed may be from six hours to ten thousand years. Two hundred feet of sixteen millimeter film, or five hundred feet of standard gauge film is ample to photograph a complete and interesting home playlet with a screen time of eight minutes. Now wait a minute! Sit down and time eight minutes by your watch before you express your disgust. A cinematographic minute has sixty full seconds in it, each an appreciable interval of time.

I shall now mention two more points, far more professional in character, with the hope that the ad-

vanced amateur will incorporate them in his home dramas to their infinite betterment. These two points are the closeup and the fades, both very common, in fact there is rarely a professional motiograph made which does not include both. They are, however, difficult to master, and must be used properly or the photoplay would be better without them.

The close-up, a discovery attributed, I believe, to D. W. Griffith, is practical only when using an actor who is capable of registering emotion in a most convincing manner, or when using a character actor who is a past master in the use of make-up and facial expression. In close-up work every bit of skill which the cinematographer possesses is called upon, and the make-up must be perfect. Motion film cannot be retouched and the lens does not flatter. The close-up is only appropriate in the display of the stress of emotion and in emphasizing action which is so subtle that it might not otherwise be appreciated. It is evident that such work requires a finished actor, the only others who provide satisfactory close-ups are infants who are too young to be self-conscious and the lower order of animals. They may, of course, be used for home portraiture, and as such will provide invaluable *records* for future reference, but in dramatic action, they may as a rule, be dispensed with in the home playlet. However, if you are filled with true amateur enthusiasm, and have an actor, or actress, whom you believe to be competent, go ahead! Success adds immeasurably to the home film as well as to the professional variety.

Do not confuse the close-up with the insert. The

insert is a close-up of a letter, a knife or other inanimate object which serves to call the attention of the audience unmistakably to the object in question, so its connection with later developments may be understood.

This brings up the question of semi-close-up, medium shot, full shot, medium long shot, long shot and so forth. There is no set rule for these terms, which are used by professionals to give merely a general idea of the action involved. I heard one cameraman give the following rules. Close-up, cut at shoulders, semi close-up, cut just above waist; medium shot, cut at knee; full shot, cut to include feet; medium long shot, vertical dimension of frame three to five times as high as an adult; long shot, to include buildings in their entirety. It will be seen that even such a set of rules must be very elastic, and are but vague at best. They may be convenient for the amateur in conversation, but in practice, common sense is the best guide, and the shot may be called by any name. A full shot by any other name will look as good. Set your camera to include the desired action without crowding and "shoot." If you desire to photograph an animated conversation, cut the actors at thigh or waist if you choose,—people now-a-days don't talk with their toes. But a dancer, cut at the knees, would be absurd. Use common sense. Don't try to include the whole universe. Get important action and let the rest take care of itself.

We are all familiar with the screen phenomenon in which the screen appears black and the picture gathers substance, and conversely that in which the picture fades from the screen leaving it black. These

are known respectively as the fade-in and the fade-out. The fades are used to separate sequences, or units of action, one of which may include a dozen or more scenes. As it is often more simply explained, the fade indicates a lapse of time, but this explanation must be given the broadest possible interpretation. The lapse of time may be a minute or it may be unnumbered years, whatever it is it is sufficient for a change in the cycle of action.

This system is arbitrary and overworked. It is not understood by the majority of film fans, except as the fade eases up the tenseness of their minds unconsciously. It is widely used for padding an otherwise too short film. For example, a youth grows to manhood. If the film is running short, and this event takes place well along in the course of the drama, a producer may insert a fairly long title explaining the lapse of time and insert it by direct cut. It is understood that the preceding action has been brought to a dramatic close and the succeeding will be opened properly, but with all fades eliminated. The producer who finds his action running short will fade out on the youth, fade in on a lengthy and elaborate art title, fade-out the title and fade in on the succeeding action. Thus, sixteen feet is added to the reel without increasing the action. Other producers cut the titles in between fades. This is a fruitful source of argument, and as yet there is no standard. It is usually regarded that the proper technique is to invariably follow a fade-out with a fade-in; but personally it seems to me to be a waste of film to put a fade on both ends of a title merely because it is

inserted between a fade-out and a fade-in. It serves no distinct purpose and the practice is only observed in order to follow the rule. However, this is a matter for the operator to decide for himself.

The fade mechanism alone of the high-grade camera costs more than the usual amateur outfit complete, so the ordinary amateur will not possess this refinement. However, a very good fade can be produced after a little practice by using the diaphragm as a fade shutter. The diaphragm should have a lever attached so that the actual movement may be as great as possible. The Ertel De Franne has an ideal diaphragm for hand dissolve work. The proper diaphragm opening for the work in hand is determined. Then the diaphragm is closed as tightly as possible. All actors are prepared for work, the hand is placed in front of the lens and cranking started. Immediately the hand is removed from the front of the lens and the diaphragm opened with a steady uniform motion until the predetermined mark is reached. This operation should take about four seconds. When the sequence—not the scene, mind you, but the sequence—is ended, close the diaphragm steadily, when it is closed place the hand over the lens, continue cranking for a turn or two and the fade-out is complete. This work is not necessary for the success of the motiograph, and it is difficult to obtain until after practice, but it does unquestionably add to the finished product.

This chapter might go on indefinitely, but there is a limit to the space at hand and to the patience of my readers, I hope that the salient points of direction,

as applicable to the amateur and the aspiring news man, have been covered at least to such an extent that the details may be worked out easily. The chapter may seem to be unnecessarily professional in character, but all points mentioned are just as applicable to the modest home drama as to the professional, multiple reel spectacle. As I have said, these rules are not as the laws of the Medes and the Persians. They are more nearly guide posts which may point the way around pitfalls. If they have been found to improve the quality of professional photo-dramas does it not seem logical to suppose that they will improve the home-drama? I have used the terms "actor," "drama," "cinematographer," "director" and other technical phrases. This does not imply that the home-drama should be an attempt at romance or adventure. Any person being photographed by a motion picture camera is essentially an actor. Any action worth photographing, no matter how simple, has dramatic elements. Likewise, the man who manipulates the crank of a motion picture camera is a cinematographer; and if he instructs his actors he is also a director. The terms are convenient—they do not deal with strange facts. We have all been actors at some time or another—either that or some of my readers are more sincere than any person it has been my good fortune to meet.

Artistic production presupposes a knowledge of the art of pictorial composition as well as of dramatic technique. Pictorialism is an art which must be learned by hard study and close observation. Any good work upon this subject may be studied with advantage, but as pictorial composition as applied to photography is somewhat different from the application of the same subject to draughting, I should advise the study of some work on pictorial photography. Few works have been published which can rival Gillies' "PRINCIPLES OF PICTORIAL PHOTOGRAPHY," Falk Publishing Co., N. Y.

The young girl in this photograph, which is a "still" from an actual production, is about eighteen years of age and is taking a rôle in her natural age. Note the voluptuous, oriental type of beauty displayed.

The mother in this plate is the same girl who portrayed the youthful rôle in the plate immediately preceding this. Note the worried expression, the dull lips, the heavy eyelids and the sunken cheeks. All attractiveness has gone and only the withered ghost of her former beauty remains. These two plates illustrate the skillful use of character make-up, supplemented by good acting

Chapter VII.

ACTING AND MAKEUP

ACTING for the camera is essentially an art and is just about as amenable to law as the more common forms of art. The greatest success is attained by those displaying the greatest individuality, but there are certain hints which may be given which will help the amateur actor to avoid the more common pitfalls of the art. Acting of any kind presupposes a certain natural aptitude for mimicry and the retention of the love for dressing up which all children possess in common. The actor must not consciously act his part, he must *live* it. As long as the idea persists that the work is imitation, an unnatural stiffness will prevade the action, and stiffness of any kind is ruinous to acting of high quality. Neither must one tolerate the idea that he is being made ridiculous. There must exist that feeling that the work is actually happening as a real incident in the life of a very real person. When the actor attains this attitude the first and greatest step toward success has been made.

The next thing to acquire is a proper tempo. The normal exposure of the motion picture camera is approximately one thirty-second of a second, and any

Acting and make-up is a complete science in itself, and a small library could be written about it. One of the best works upon this fascinating subject is "SCREEN ACTING," by Inez and Helen Klumph. Falk Publishing Co., N. Y.

motion which is appreciable in this interval of time produces a blur in the film, which although absolutely permissible in news work and work which has a naturally quickened tempo destroys the needle sharpness which is so desirable in the finished picture. Practice motions which are rather slow. Not slow enough to appear sluggish, but lacking that nervous rapidity which is a racial characteristic of Americans. Start a motion slowly and increase speed. Avoid all suggestion of jerkiness. A close study of an accomplished ballet dancer will be beneficial. Her movements are rapid but do not appear to be so because each motion is made gracefully and with a definite acceleration. Another good study is a comparative study of news reels and dramas. The usual human animal in a news reel resembles nothing in nature so much as an ant. A man will rush into the scene, a formless blur. He will stop as suddenly as though brakes had been applied. He will turn his head with a jerk. He sees the camera, stares into the lens, then, presumably at a sharp command of the cameraman he grins foolishly and darts from the scene in another blur. The average person in a news reel is a complete illustration of what the screen actor must avoid. This does not mean that screen acting is artificial. On the contrary, it is supposed to be an exact representation of nature. However, the lens has its limitations and also the motiograph renders conspicuous certain limitations of normal vision of which we are unaware in ordinary life. So the slow tempo of the actor appears quite natural on the screen. Do not get the idea that the action resembles

the slow-motion pictures we have seen on the screen. It probably takes the normal human being as long to pick up a glass and drink as it would an actor, but the tempo is quite different. The ordinary person would thrust out a hand—pause—grasp the glass—pause—raise it to the lips and drink. There is no pause in the actor's motions. He begins to grasp the glass the instant his fingers touch it. It has begun to move before his grasp is firm. The whole movement is continuous with no jerks. Again, in the news reel the bobbing heads are really comical. A crowded sidewalk looks like a motiograph of a pen of kangaroos. Train yourself to move with a full ankle movement. Walk with the slightest possible change in the elevation of the head. Do not stride or mince. Walk firmly and gracefully but without bobbing like the cork on a fisherman's line. I have often heard the remark in Hollywood, "You can spot an actor by his walk," and it is true. This walk has been characterized by certain ill-natured people as a "strut" but the fact remains that one will rarely see more graceful carriage than that used by the professional actor. It combines at once, grace, lithesomeness and dignity. The best study is the screen itself. Go to the theatre, not to enjoy yourself, but to study technique. The peculiarities of the actor's walk are as evident upon the screen as upon the street, but like bathing suits on the beach, we do not notice them in their proper environment.

As a race we are inclined to suppress our emotions, and in consequence we are acquiring poker faces. The face of an actor is his most pliable tool, and both abso-

lute flexibility and absolute control are necessary. Remember, you have no words to help you out, and pantomime is limited in its expressive power and liable to misinterpretation, but an unmistakable facial expression is a universal language. Bearing this in mind you will understand that the natural expression must be exaggerated. Not to the point of caricature, but to such an extent that the necessary emphasis is placed upon the emotion being registered that its import will be unmistakable. Practice before the mirror. If you try to register the various emotions without this aid you will but make a series of meaningless grimaces, but with the aid of the mirror it will be seen that an almost imperceptible shifting of one or two of the delicate muscles of the face will work wonders. The secret of success in acting is practice—more practice and more practice.

When using gestures keep the hands low as much as possible, that is below the level of the shoulders, for otherwise there would be a possibility of covering the face. Always make sure that the lens sees you, but whatever you do never, never look into the lens. A swift glance at the director or the cinematographer will show you if the path from the lens to you is unobstructed. Do not let any other actor crowd in front of you, that is between you and the lens. Should anyone do this, very quietly and unobtrusively shift your position so that the lens sees you. The director will often take care of this work but it is your duty to help him out. These three hints are for the same purpose. Your face tells your story and the audience should be able

to see it at all times. This keeping in the lens is not screen hogging, but is a necessary part of your work. Of course, it is understood that there are hundreds of situations which will render it necessary for the proper action, that you be hidden but if there is no distinct reason for doing otherwise, it is well to remember the above hints.

Screen hogging is a fine art, although it is not a very admirable one. One would think that to hog the screen the proper procedure would be to crowd into the lens, in front of everyone else, but such is not the case. If you should do this, you would cross the front focus line and your figure would be but a blurred blot on the screen and you would be reprimanded by the director.

It is amazing to study the dramatic action of the modern screen-play. The bulk of the action is primarily enacted between two characters who work opposite each other. There may be extras by the hundred, the setting may represent thousands of dollars, there may be a half dozen actors in important roles, but all of this is usually but a background for action between two characters, though, of course, the identity of the two changes constantly, but in each scene as shown there is action between two characters. Each of these characters will want to secure a prominent position on the screen, especially if they are comparatively unknown and are "working up." In order to do this each will slowly work backward, *away from the camera!* This is done so that the face will have to be turned more directly toward the camera in order to face the actor working opposite, and he will be forced

to turn his back to the camera for the same reason. To avoid this, the second will also work back, and so it goes, a regular see-saw. I have seen retakes necessary because actors trying to hog the screen worked backward beyond the limits of sharp focus and the camera would stop sharp while the cinematographer addressed the world at large and the screen-hogs in particular.

Know your action and interpretation as well as you can before venturing before the camera. Some directors do not let their actors know anything about the scenario, but those who obtain the best work from their cast have each leading character read a copy of the working script before the work is started. If you understand your part in full, you will find it far easier to give a consistent interpretation.

If you should be working in a drama which is laid in a foreign country or some historical period, try to learn everything possible concerning that country or period. There may be some detail of gesture or costume which seemingly trivial, is of vast importance, and if the film is ever published, there will be sure to be some spectator who is familiar with the setting. An incorrect interpretation will be condemned by him, but a correct interpretation will gain for you the approval of an expert in his own field. Of course, this is not so important in itself in amateur work, but remember always that amateur acting may open the door to a professional career just as surely as amateur cinematography may do the same thing.

The make-up of the actor is quite as important as the costuming and action. A poor make-up may ruin

a splendid bit of action, and, conversely, a perfect make-up will go a long way toward compensating for poor dramatics. In considering make-up, the first consideration is the necessity for such a thing. Make-up of any kind was not primarily developed as a disguise,

The actress before making up. Note the freckles, the lightness of the brows, the moderate size of the eyes and the dullness of the lips. Such effects appear natural to us in photographs because we have become accustomed to the inaccurate rendition of color values by the ordinary photographic emulsion.

but as a means for restoring the natural appearance of the face under conditions which changed its appearance. The lighting of the legitimate stage, together with the distance which separates audience from actors, makes the natural complexion appear sallow and un-

pleasant. For this reason the natural coloring is heightened and the result, when properly done, is a close approximation of the natural appearance. In motion picture work, however, the make-up serves a different purpose altogether, and if stage make-up were applied for screen work the result would be horrible.

The sensitive emulsion used on motion picture film combines the properties of speed, gradation and fine grain. It is remarkable that such a combination has been produced at all, and no more could be asked. It is obvious, therefore, that we cannot ask for orthochromatism, and this means that the film is sensitive almost exclusively to the ultra-violet and blue rays, being even more limited in this respect than the ordinary roll film. Although we have become accustomed to the outrageous rendering of color value of the common film, it cannot be used in motion work. A dead white face, or a chocolate brown one would soon be condemned, and for this reason the motion picture make-up has been devised, and the colors used are those which will give the most life-like presentation on the screen after having been photographed on a non-orthochromatic film. It furthermore serves to hide facial blemishes such as freckles, moles, and scars. It is obvious that motion film cannot be retouched, so these details must be cared for on the body of the subject. With proper make-up, it is possible to make a portrait which will require no retouching whatever, so it may be seen that make-up has its uses not only in amateur cinematography, but in home portraiture and other work where it is desired to avoid retouching.

An elaborate make-up outfit is not necessary. The whole equipment can be carried in a modern vanity case. The materials for a lady are: Theatrical cold cream, motion picture yellow grease paint, motion picture face powder, two or three small chamois stumps as used by crayon artists, one each blue, gray, crimson and green grease paint liners, medium moist rouge,

The ground color of Motion-picture Yellow has been applied, but no further work has been done. Note that the face is of a smooth and uniform tone but all other defects of Plate X have been intensified. The towel and apron serve to protect the hair and clothing from grease and powder. A typical field make-up is shown upon the table.

mascaro, powder puff, absorbent cotton, a soft cloth and a supply of toothpicks. The outfit for a man is the same except that the grease paint is motion picture orange. No other materials will be needed except for character work.

First of all, the face must be scrupulously clean. Then a liberal amount of cold cream is thoroughly massaged into the face. When this is done all the

surplus cream is wiped from the face with a soft cloth. Don't be afraid of removing too much. If the massage has been properly attended to, the skin will have absorbed all that is necessary, so the face can be thoroughly wiped. An excess of cream will give a messy and streaked make-up which it is impossible to remedy except by removing it and starting all over again. The grease paint, yellow or orange, is then applied in wide streaks until all of the exposed portions of the face and neck are covered. This is then blended by massaging until the whole ground is of one even tint. When this is done the face will have lost most of its character and the features will appear insignificant, the eyes especially appearing small and anything but beautiful

Next, the accents are applied. The ground is carefully wiped from the lips and the rouge applied very lightly. In this step avoid the artificial Cupid's bow, and follow the natural contour of the lips. If the mouth is large, the lips may be shortened a trifle, but otherwise the natural curve is followed.

The next step is the eyes. The importance of the eyes can hardly be over-estimated. I once heard a motion picture director state that a motion picture actress was nothing but a pair of eyes. With every other feature of ideal beauty, no girl can succeed as a motion picture star if her eyes are incapable of being made beautiful. Remark that I said "incapable of *being made* beautiful!" Many are not beautiful naturally, but before the make-up table, they can be made so. The first step is to consider whether the eye is naturally prominent or sunken. If the eyeball

is set deeply in the head, then a very good eye-shade is green, but for the prominent eyeball, crimson or other deep, rich, photo-dark color is the best. Each actor and actress eventually develop a color scheme of their own. I shall consider the make-up of the actress. That of the actor is the same, but less sharply accented.

Any surplus ground is removed from the upper lid, and the tip of the little finger, heavily charged with crimson—or whatever color is used—is rubbed over the lid. When the lid is covered the color is wiped from the finger, and by careful dabbing the color is blended to the side of the nose, to the brow and out into the ground at the outer end of the lid. With no further charging with color, a very faint tinge of color is applied to the lower lid and blended in all directions into the ground. Success in this operation is only attained after practice. Now charge the broad end of a toothpick with crimson and lightly line the edges of both upper and lower lids and continue both in a single short stroke outward from the outer corner of the eye, about a quarter of an inch long. Now slightly blend these lines with a chamois stump, taking away the harshness, but also taking care that the distinctness of the line is not destroyed. It must be very definite, but not so sharp that it looks like a pencil mark. The final step is placing a tiny dab of crimson, or better, of scarlet, at the inner corner of the eye. The eye will now appear much larger and more lustrous than before, but the colors used will appear clownish at first. The lashes and brows appear faded and dim, but they are cared for at the last step.

The tip of the little finger is now very, very lightly charged with crimson, and a small dab placed at the center of the chin. This must be so faint that it is barely perceptible and must be most carefully blended into the ground. The same is now done at the front of each nostril, as lightly and as carefully as before.

The make-up complete. The hair has not been dressed in order that the details of the make-up may be clearly shown. Note the lustrous beauty of the eyes brought out by skillful make-up. As we are used to the usual color rendition, the brows and lips seem too heavy, but upon the screen this is not apparent. Note that the freckles have disappeared. The dimple in the chin is made by a mere touch of red blended so as to accent the original slight depression. The lips are rouged upon the natural outline as the cupid-bow once so popular on the stage is not at all successful on the screen. The slight "tail" at the outer corner of the eye and the dot of red at the inner corner serve to increase the apparent size of the eye. A strongly marked "Moustache" will be noticed upon the upper lip. This is due to perspiration, which is hardly noticeable in real life but which photographs strongly. Immediately before each scene the actors carefully remove all moisture from their faces with absorbent cotton, being careful not to disturb the make-up. This is known as "mopping-up."

Never, except in character work, place any coloring on the cheeks. It will make you appear consumptive in the picture.

Now dust the face thoroughly with motion picture face powder. Pile it on until it appears dry and velvety. The first application will absorb grease from the paint and appear moist. When the whole face appears dry, the surplus powder is removed. Hold a circular, lamb's wool puff by the extreme edge and with the opposite edge stroke the face as lightly as possible, dusting the puff at short intervals to dispose of the surplus powder. When this is properly done there will be no streaks, the dry powdery appearance will have disappeared, but the greasy appearance will be gone also. The face is now ready for the final touches.

Take the little brush found in the mascaro box and after wetting it, rub in on the cake of color until it is charged brush, taking care not to touch the lids. This the brows and the hairs will take on a coating of color while the skin beneath is not soiled. This gives a natural appearance which can never be obtained with the eyebrow pencil. Now brush the lashes with the charged, but not dripping wet. Pass this gently across requires practice at first and patience at all times, but the result is worth working for. Finally wipe all the powder possible from the lips without disturbing the rouge and you are ready for the hairdresser.

All of this sounds troublesome and unnecessary, but two test films, one made without actors in make-up and one with, will demonstrate to all concerned that make-

The actress who posed for the three preceding plates is shown here in actual work in the studio It will be seen that the make-up does not appear to be over-done.

up is vitally necessary to any motion picture work. A comparative study of dramatic productions and news reels will also demonstrate this point clearly.

A library could be written on character make-up and still be far less satisfactory than an hour's coaching by a professional. However, for those who wish to experiment I shall give a few hints. The most common character type is that of age. In this make-up, a tinge of red, surrounded by a tint of green is applied to the cheeks, following the natural contour of the hollow made by sucking in the cheeks. This tinge is light and most carefully blended into the ground. The lips have no rouge applied, but are covered with ground, the natural lines of the face are determined by grimacing and then accented with a line of crimson, while at the side is placed a stroke of white. These are carefully blended. The wrinkles around the mouth are short lines of crimson, blended. The brows are colored before the powder is applied, and the lashes are untouched. The lower eye-lids are more heavily colored than usual, to sink the eye farther, but the eye color should be gray, or steel blue grease paint.

The accompanying photograph is that of a young man about twenty-five years of age, portraying an aged rake of mythology. The bald effect is obtained by a chamois foundation bald wig. The edges of the band were lined, and on the screen the lines blended into the facial lines, and the obvious line of the wig was not noticeable. The pouches under the eyes were formed from nose putty and the double chin obtained in the same way. The lines of the face were crimson

Here we have a rôle in a drama founded upon an old Greek legend, "Bacchus and Silenus." This is Silenus, a jolly old debauchee. In life this actor is a young man of rather aquiline features and slender figure with an abundant growth of hair. Note the sagging pouches under the eyes, the inflamed nose and the hanging jowls. This is all nose-putty. The shaggy brows are of crepe hair, the lines of red and white blend and the wig an inexpensive bald wig. This man was an amateur and shows the skill in make-up which may be attained by anyone in a short time.

and white blended, and the missing teeth were stopped out with black wax. The nose was enlarged with nose putty and tinged crimson and the shaggy brows made of gray crepe hair attached above the natural brow with spirit gum. The veins of the hand and arm were accented with crimson. This make-up is a fair example of character work by an amateur actor.

Nose-putty is a pink, waxy substance capable of being moulded in the hands, and which adheres for some time to human skin which is free of grease. No cream or paint should be applied to those portions of the face which are to be built up with nose putty.

Black wax, is a similar preparation, which when applied to the teeth adheres firmly, yet may be easily removed. When black wax is applied to a tooth, the appearance is as though that tooth were missing. Tooth enamel should also be mentioned here. Gold and discolored teeth photograph dark and sometimes may appear absent, but the tooth enamel covers the tooth with a pearly white coating which is entirely harmless, adheres firmly, and may be detached at will, coming away in the form of a film.

Crepe hair is a hair product which comes in braided strands. When first unbraided it is very crinkled, but patient working and pulling will leave it but slightly curly and a one foot length will be about four feet long or more. A half dozen six inch lengths of the original braid will make an ample, flowing beard. The hair is pulled out and arranged with the fingers, then a few strands at a time it is fastened to the face with spirit-gum, which is purchased already prepared.

Crepe-hair finds its greatest usefulness in making "tramp" beards, shaggy brows, and in softening the harsh outline of wigs.

Hair goods, wigs, moustaches and so forth, when used at all should be of a good grade. Do not try to work with the cheap carnival or masquerade grades of hair goods and expect to obtain any effect other than that of a burlesque.

Although not strictly make-up, costuming may be mentioned here. Light costumes against a dark ground tend to accent the figure, but in any case they darken the flesh tones by contrast. Dark costumes render the figure more inconspicuous except against contrasting grounds and, as a rule, are applicable to the heavier dramatic moments. They lighten flesh tones by contrast. A medium shade is usually, therefore, advisable. Pure, delicate yellow, neither lemon nor orange is good, so also is a very delicate pink, steel, lavender and similar shades are good for male characters. In modern costuming, of course, ordinary clothing is worn, white being avoided when possible as it is unpleasantly harsh and tends toward halation.

Heterogenous costuming is to be avoided. I do not mean to suggest uniforms, yet each costume should be appropriate to the action and for this end, all costumes will be in harmony. Any unusual costume display, except in regular costume plays, is distracting. The costume should attract its share of attention, but should not distract the attention from the more important parts of the production.

Don't overdo the personal preparation. Let the

make-up be just sufficient to present the actor in his most attractive natural appearance, and let the costume be that which we should naturally expect under the given circumstances. In photo-drama, even more than on the stage, we strive to present that which shall pass for an excerpt from real life.

Chapter VIII.

TITLES

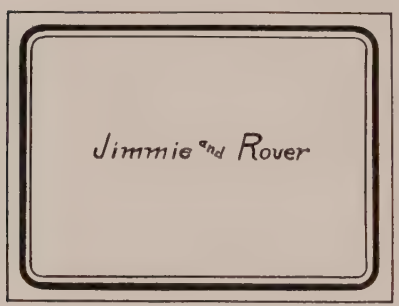
THE popularity of the autographic Kodak has proved that the photographer is prone to forget.

All pictures should have a title and a date. These are valuable in later years. In like manner, the most modest photo-playlet should at least be identified as to incident, place, date and actors.

Recently professional cinematographers have been producing very complex "Art" titles, some so much so that there is far more "Art" than title. These add to the effect of a great photo-drama when not overworked, but they are unnecessary for the amateur. However, these titles are not difficult to make, if the operator desires them, being simple double exposure work, but to my mind the most legible and artistic title is a plain white letter on a black ground, surrounded by a simple border.

The perfect photo-drama should require no titles beyond the introduction, but unfortunately we have not yet reached perfection and titles must be used. As they are auxiliary and incidental, they should possess one characteristic above all else. That is legibility. They must be read in the shortest possible time, and should therefore, be clearly defined on a contrasting, monotone ground. They should be brief, concise, to the point, and above all, legible. Some art-cinematographers

have said that too much contrast spoils the effect! I do not agree. So long as the body of the letter, the lines which compose it and the border are drawn in a style which is rather slender, with clean cut edges and all "fancy-work" eliminated, the more contrast the better the title! The whiter the letter and the blacker the ground, the more legible is the title, always provided halation has been avoided. Broad, heavy lettering spreads too much light over the screen, giving an effect of halation even though there is none on the film. In this case the clean cut edge is lacking and the legibility lessened.



These titles are not submitted as designs to be copied, but merely as a suggestion in the treatment of borders. The opening title should usually be more elaborate and heavier than those following.

It is presumed that most of the films which my readers make will be printed but one or two times. In that case, there is a trick used in studios for temporary titles which will be valuable. This method is not adapted to the Vitalux or other non-standard form of film, nor is it adapted to the reversal process, in

which process, however, nothing would be gained by using it.

Draw your title card about 10 x 12 inches. Instead of following the usual procedure and drawing white letters on a black ground, this procedure is reversed and black letters are drawn upon a white ground. Fill the camera with positive film. The emulsion on positive stock is more contrasty than that used on negative stock, and also lacks the gradation. Positive emulsion may be compared to the emulsion used on process plates. This procedure makes it easy to obtain a good, sharp title, just as process plates are the best for line copies.

Photograph the title card and develop the film. The resulting negative will show white letters on a black ground, and this title strip can be cut directly into the body of the film without having to print it. In doing this, care must be taken to see that the celluloid side of the title film corresponds to the emulsion side of the print. This will make the wording read correctly. If the usual patch were employed, the lettering would be reversed. The difference in the focus of the two emulsions will not be noticed on a small screen. On large screens, however, the slight thickness of the film will necessitate a refocus for titles, so the process is adaptable only for home and temporary studio use.

The production of good titles is only possible by the use of some kind of a title stand. If I know the amateurs of this country, few will follow my design, but I offer it as a basis upon which the individual designs may be developed. The most radical change I

am familiar with is the vertical stand, similar to the cartoon stand. This bears the same relation to the stand described that the vertical enlarger bears to the horizontal model.

A title stand should incorporate an easel which may be moved in both directions perpendicular to the lens axis, and which may be set at various distances from the camera. These adjustments permit the easy centering of the card and the use of different sizes of cards. A support for the camera is also necessary, which will ensure the correct relation between lens axis and easel. The whole stand must be as rigid as possible. Any vibration of either camera or easel, which does not affect both alike will produce a title which dances on the screen, than which there are few things more annoying.

The stand I use is made as follows: Procure a quantity of good hardwood, say six pieces of dressed two-by-four, eight feet long. Bore these and clamp together with half-inch bolts in such a way that the four inch sides are together. This is similar to the manner in which the floors of bowling alleys are laid. This will give a good solid bed four inches thick, a foot wide and eight feet long. Attach the legs to set obliquely, so that the floor space occupied is about three by ten feet. Cross-brace the legs midway between the floor and the top of the bed. Make all fastenings with large screws and bolts. Do not use nails! The accompanying cut gives an idea of the finished table.

We are now ready for the easel. The body of the easel is a square made of two-by-fours, measuring one

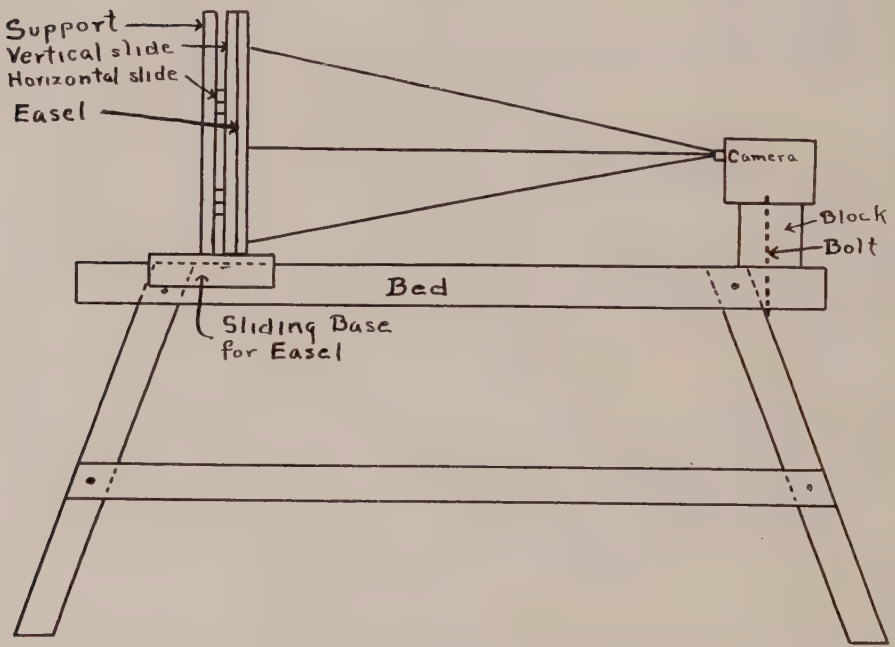
foot on each side. This will resemble a box a foot square and four inches deep, but with neither top nor bottom. This is now cross-braced on the side which will be toward the back.

Next, procure four pieces of matched material, that is, with tongue and grooves, similar to flooring. Get this in good hardwood, with uniform tongue and groove so that one piece will slide against the other, without binding. Ripsaw these, which will give four pieces with a tongue and four with a groove. Fasten two grooved pieces horizontally across the uprights of the easel, about eight inches apart, taking care that they are exactly parallel. Set two tongued pieces against these so that the tongues engage the grooves, and tack strips to the tongued pieces so that their relative positions may be maintained. Remove these pieces and lay them upon a table. Place the other pair of tongued pieces across them at right angles, also about eight inches apart and exactly parallel. Screw the four pieces firmly together, taking care not to disturb the relative positions, and then remove the temporary braces from the first pair.

Now obtain a flat board about fourteen by eighteen inches in size. Place the double cross in its slides on the uprights of the easel support. Stand the easel board in front of this and mark its position. Now remove both board and double cross and lay them upon the table, placing the double cross in the position indicated by the marks. Now take the remaining grooved pieces and engage them with the tongued strips which lie next to the board. Screw the grooved pieces to the

board and the easel is ready for the assembly. Take board and double cross and slide into the grooved supports on the easel uprights. You will now find that the board can be moved sidewise or up and down.

The easel will be unstable, so a base must be pro-



The Motion-picture Title Board Complete. This shows table, easel and camera with the path of the light-rays indicated.

vided. Remove the easel board. To the bottom of the frame screw two pieces, 1 x 4 x 12, extending backward from the frame six inches and forward two inches. Brace at the back with diagonal braces. Now screw to each side of the frame a piece of one by six, which will drop over the edge of the bed two inches. These

aprons will allow a free forward and backward movement but will prevent any rotation around a vertical axis, thus maintaining parallelism between board and focal plane.

You are now ready for the camera support. Raise the easel board, or the easel as I shall now call it, about four inches from its low limit, and measure the distance from the bed to the center of the board. This may be about eleven inches. That will do for illustration at any rate. Now measure the distance from the bottom of your camera to the center of the lens. Suppose this distance is five inches. It follows that the camera must be raised six inches above the bed of the title stand to bring the lens opposite the center of the board with the latter in a medium position.

The support must be most firm. In this case, screw a block six by six by two to the bed at one end, keeping the block in the lateral center of the bed. Now screw to it another block of like dimensions and upon this a third. You will now have a support six inches square which is to all intents and purposes integral with the bed. Now bore a half inch hole vertically through the center of this block.

Procure a half inch rod and have one end threaded to fit the tripod socket of the camera, with a lathe cut of the same size a half inch long, or else have the threads extend a full inch. The distance from the bottom of the bed to the top of the block is ten inches. Ten and a quarter inches from the threaded end of the rod have a two inch collar pinned on, and two inches below this a cross rod one-quarter of an inch diameter

and six inches long passed through the rod. Now thrust this through the hole and engage the screw with the socket of the camera. When it is tightened up the collar will prevent its passing through the hole and as force is exerted the camera will be firmly clamped to the table. Make sure that the axis of your optical system is parallel to the center of the table and you are ready for work. This applies to cameras with lenses in the center of the box. In cameras having the lens at one side of the front of the camera box, the hole through the block should be offset to bring the lens immediately above the center of the table.

The lighting of titles is quite an art, but one which can be mastered with a little practice. If the title stand be outdoors, two soft reflectors, one on each side will provide sufficient illumination. After setting the reflectors, step back and see if both sides are receiving equal illumination. If not, readjust the reflectors until the lighting is uniform. However, outdoor lighting is not the most advisable for titles, owing to its lack of uniformity from time to time. The lights which I shall describe are very good for title work and will also serve for photographing indoor subjects.

First, a standard must be provided which may or may not be adjustable as to height. I shall describe the adjustable stand. Make a stand similar to the old-fashioned hall tree, with three feet and a standard two inches square. This standard should be four feet high and have a small hole bored through it every two inches, from its top to a point one foot from the floor. The second standard is of like dimensions with

a small hole bored at a point two inches above its bottom. Metal straps, three or four in number, are now screwed to this piece. These straps are of such size that the first standard will just slip into them. Thus, the two portions may be adjusted in the same manner as a surveyor's sighting rod. A nail thrust through the small hole and through some corresponding hole in the lower standard will maintain any desired height. The standard is now ready for the lamp box.

Make a hollow frame of one by six inch material, eighteen inches square. Mount three electric sockets on the inner side of each side. Connect these sockets to one pair of wires and connect a standard plug to these wires. The extension cord should be about ten feet long, although this will be governed by the position of available feed sockets. Now cover a piece of wall board with tinfoil and nail it, tinfoil side into the back of the frame. Finally, insert in each socket a sixty or one hundred watt blue bulb. The result will be a lamp of seven hundred and twenty or twelve hundred watts. It will be well to determine whether your house circuit will stand a drain of twenty-four hundred watts, or approximately tweny-four amperes before you connect these lights. The usual house fuses are six to ten amperes only.

These lights are good for titles, and will also render possible the making of indoor cinematograph scenes where only a small area is to be included. They will also serve to supplement daylight indoors, thus rendering unnecessary a great expenditure for arc lights. Another desirable feature is that when a bulb burns out the replacement cost is comparatively low.

It must be remembered in using the Vitalux camera that all titles must be photographed in their proper sequence for cutting is not practical. In using the sixteen millimeter film it must also be remembered that titles must be white on black, for this film is reversed in development so the use of negative titles is unnecessary and undesirable.

Some standard of length for titles must be used. The ordinary professional usage is to allow one foot per word for the first ten words and one-half foot per word for all succeeding words, with a minimum of five feet for any title. *Caution!* This is computed for standard gauge film. It would be better to substitute the word second for the word foot, and in this case the rule applies to any film.

The wording of titles is an art. Suppose that in our domestic playlet Johnny has cut his finger and runs to tell Mother. The producer who is blindly groping for high art and who has to pad his film to make up sufficient footage would use something like this:

"Urged by the incomprehensible promptings of carefree youth, Johnny, the idolized son of a doting mother, while seeking the family cleanser, finds his father's razor. Thinking to enter man's estate, he determines to perform a tonsorial operation upon himself, but in opening the ugly blade he wounds himself. Life having swerved in an instant from joy to tragedy, he hurries to that eternal haven of childhood, his mother's arms."

For forty seconds we have to look at this, and one-twentieth of the reel has been used. You are all fa-

miliar with such titles. It means that forty feet of film have been used to pad the film. On the contrary, the amateur is likely to try to conserve film, so he inserts this title and gives it two seconds:

"Johnny and Mother"

Two seconds is a mere flash, and practically no one unfamiliar with the film can read it at all. Such a title requires the minimum of five seconds, and the full five words, or a few more might as well be used, for if we use titles at all they must fulfill their purpose. To be of any value at all, such a title should read something like this:

"Johnny Has An Accident"

The action shows that his finger is cut, and that he is showing it to his mother. Our film is interested in the maternal solicitude, so the origin of the cut is of little moment. We all know mothers and children. The child naturally seeks its Mother in times of trouble. The title serves to draw the attention of the audience to the fact that something has happened and the general nature of the occurrence, that is all that is necessary. Don't tell your story in titles, it is not only an insult to the intelligence of your audience, it is an admission on your part that you have not the ability to present a story in pantomime. Don't be too obvious, that is on a par with the bore who repeats a story two or three times, and then laboriously explains the subtle (?) point involved. Let your audience use their minds. Your purpose is but to direct the general flow of thought.

Many large studios make use of typewritten titles for editing and other temporary uses. Type the title you require and photograph it on the title stand. The easel will have to be much nearer the lens than when using 8 x 10 or larger cards. The resulting title if fully processed will be black on white, or if negative titles are used they will be white on black. Although not attractive these titles serve their purpose.

Every film should have an introductory title, which is really the title of the film, as well as subtitles which are explanatory in character. A suggestion for an opening title would be:

THE BROWNS

Mother.....Mrs. Mary Brown
The Infant.....James Brown, Jr.
The Dog.....Rover Brown

Second title:

The Brown Mansion, Pikeville, Iowa
September 1st, 1924

The suggestion of professional form in the titles will give the simple little domestic playlet a certain savor which will make it, like wine—or should I say, in these dry days, like violins—improve with age. The stilted effect adds a piquancy somewhat comparable to that given the minuet by the quaint formalities of a byegone day.

Other titles should be short and infrequent. You must remember that people now-a-days go into their libraries to read, but when they sit and watch the magic screen, they do so that they may see drama

enacted before their eyes. Your first efforts will probably be half reels, or eight minute runs. Try to avoid more than eight subtitles in this amount of film.

It is well, unless your playlet has perfect dramatic form, to add at the end of the run about five seconds of this title:

THE END

It carries an unmistakable air of finality, which is well—otherwise your audience might think the film had broken and sit waiting patiently for further developments. Do not let this discourage you, many commercial producers find it necessary.

Chapter IX.

DEVELOPING AND PRINTING

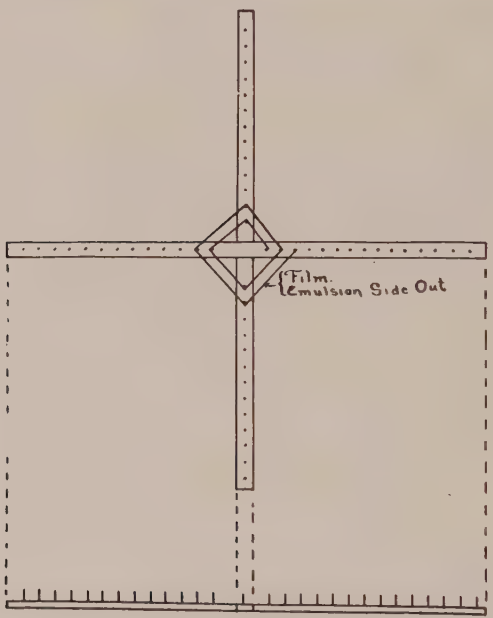
FIRST, if you wish my earnest advice—let some commercial laboratory do this for you. Did I not know the amateur so well, I should close this chapter here; but knowing him and knowing that he is never contented while some process remains uninvestigated I clearly understand that I shall have to proceed. The actual steps necessary for the completion are almost identical with those in still photography, that is, the development of the film, fixing the negative, drying, printing, development and fixing of the print, drying and projecting. Of course, the usual washing and rinsing steps are included. The big difference lies in the fact that the usual motion picture film is a long and cantankerous piece of celluloid ribbon which winds its two hundred feet of snaky length about you at every opportunity.

Some kind of a rack is necessary to control this film in the course of development, and trays to enclose these racks are necessary. For convenience and the maintenance of a high moral code I should most earnestly advise that no lengths greater than fifty feet be attempted at one time. This length is ample for from one to five scenes, and if each scene be notched in the process of making the exposure, following each scene, the film can be divided into any convenient

lengths. Trays to take a fifty foot rack are comparatively small, and in a pinch, these lengths can be dried by hanging from the backyard clothesline. These short lengths can be handled without any racks at all—in making preliminary trick picture tests I have often developed twenty-five to thirty feet of standard film without the use of a rack, but a rack is convenient and will make for cleanliness and will save much film which would be otherwise ruined.

Before proceeding with the description of the rack I shall mention the marking of the film. Professional cameras and many amateur instruments are equipped with punches which clip a portion of the edge of the film or punch a hole in it when pressed. However, these marks are so easily overlooked in the laboratory that most cinematographers at the termination of a scene crank twice to wind the end of the scene into the magazine, open the camera and clip out a triangle from the edge of the film, about a quarter of an inch deep, wind this past the gate, close the camera and crank the fogged film into the magazine. This provides an unmistakable mark for the guidance of the laboratory worker, and when dried, the fog makes the termination of scenes easily located. It is always well to be as saving as possible, but too great effort in this line will prove expensive in motion picture work, for only a few retakes will cost more than many feet of fogged and clipped film. The hand clipping has the additional advantage of keeping the interior of the camera box free of film shreds and clippings. True, catch boxes are sometimes provided, but they do not always work as they are intended to do.

We will now proceed with the description of the rack. This is made by carefully constructing a cross of wood with a mortised joint. The pieces should be of cypress, one by two inches, with the two inch sides uppermost. Starting about three inches from the center



Plan and side elevation of the developing rack for lengths of 100 feet and less. This shows how the pins are set and the manner of winding the film. The tank is merely a box to hold the rack and is lined with acid-proof enamel.

bore small holes every three-eighths of an inch along each arm. Insert in each hole a brass pin which will extend upward a distance equal to fifty per cent. more than the width of the film being used. Fifty millimeters will be ample for developing 38 millimeter film, and twenty-four millimeters will be sufficient

for sixteen millimeter film. Now obtain a piece of cord five feet longer than the proposed capacity of the rack. Tie this to one of the center pins and wind it spirally about the pins, inserting pins as necessary, until enough have been inserted to take all of the cord. Now add another complete row and cut off the arms of the rack one inch beyond the last pins, and the rack is complete. The tray is simply a shallow wooden tray, one-half inch deeper than the distance from the bottom of the rack to the top of the pins. If the tray is of cypress it may be painted with tray enamel and used, but a better construction is to line it with galvanized iron or sheet lead and then paint it with tray enamel. Three such trays will be needed.

In the darkroom the exposed film is removed from the magazines, the roll tightly held in the hand, and about a foot of the end pulled from the roll. The extreme end is then doubled about one of the inside pins and pinned with a common toilet pin. Then, unrolling just enough to place on the rack, wind it spirally about the pins until the length is on the rack or the rack is full. When using a full roll, feel the edges for clip marks, and at the last one felt, as the rack is nearly filled, tear the film, secure the free end as in the first place, by doubling about a rack pin and pinning. Now replace the remainder in the magazine before proceeding farther.

Winding the film requires attention to three points. First, any slack between the roll and the rack will inevitably result in finger marks, dust marks, dirty film and a legion of other troubles. Second, the film must

be wound tightly on the rack, as the film stretches in the baths and any slack would permit it to float out of the rack and become tangled. It is to prevent this that the pins extend upward above the film, so that ample developer can be used without entirely submerging the pins. Third, be sure, absolutely sure, that the celluloid side of the film is next to the pins, otherwise your film will be ruined.

You will probably use Eastman film, and the best developer I have found for it is their No. 16 developer. I use this developer for both negative and positive—but never, never use the same bath for both negative and positive. Use the same formula, but not the same solution. The No. 16 formula, as furnished by the Eastman Kodak Company is:

Water	One gallon
Metol	18 grains
Sodium Sulphite (des)	5 ounces, 130 grains
Hydroquinone	350 grains
Sodium Carbonate (des)	2½ ounces
Potassium Bromide	50 grains
Citric Acid	40 grains
Potassium Metabisulphite	87 grains

This formula is reduced from the original ten gallon formula and is based on avoirdupois weight.

The rack should be lowered into the solution slowly, then raised and lowered rapidly several times to clear

A full list of professional formulae for developers, fixing bath, tinting, toning and so forth, as well as detailed theoretical discussion of the technique of cinematography can be found in the "CONDENSED COURSE IN MOTION PICTURE PHOTOGRAPHY," published by the Falk Publishing Co., N. Y.

the film of air bubbles. During development the film is examined from time to time and when the image shows up strong and clear on the back, rinse and immerse in the fixing bath which is the usual acid-hypo bath, made either with common alum and acetic acid, or with chrome alum and sulphuric acid.

When the film has been thoroughly fixed and washed it is ready to be dried. This can be done by hanging the film from a clothesline, pinning it up about every five feet, but such a method results in uneven drying and consequent uneven density in the finished film. It also is frequently the cause of dirt on the film, scratches and other faults and is most inconvenient.

A small drying rack is easily made, and will pay for itself in the improved quality of the first film dried upon it. Obtain two bicycle wheels and some light wooden strips, about one-quarter by one-half inch and as long as the rack is to be, three feet being ample for sixteen millimeter work, and for standard work it should be five feet long. This is calculated for thirty inch wheels. The strips are nailed to the circumferences of the wheels, about every six inches. The complete affair is a skeleton drum, a trifle more than thirty inches in diameter and as long as the strips. Sixteen millimeter film can be wound a layer in each inch, and two inches of linear space should be allowed for each turn of standard film. A drum three feet long and thirty inches in diameter, will accommodate thirty-six turns of sixteen millimeter film, each approximately ninety inches long, therefore, 36 x 90=3,240 inches or 270 feet of film. This allows plenty of leeway. In

like manner a five foot by thirty inch drum for standard film accommodates one turn for each two inches of length, so, each turn being ninety inches long, 90 x 30=2,700, or 225 feet. A drum of any capacity can be calculated using this method.

The drum is mounted on an axle, and some motive power is applied which will keep it turning, thus assuring even drying and consequently even density. A small sewing machine motor, or even one of the smaller 110 volt motors used to operate toys, will serve admirably. In case a large pulley is not at hand, the belt can be run over one end of the drum itself. A third bicycle wheel fastened to one end of the drum makes a fine pulley. The motor drive wheel should be small enough that the drum makes from one-half to two revolutions per second. The movement must be slow enough that there is no danger of the film being thrown off the drum, but it must be fast enough to ensure even drying of the film.

When the film is dry, it should be polished before removal from the drum. This is done by moistening a piece of chamois leather in alcohol and while turning the drum by hand, briskly rub the celluloid side of the film with this moist pad.

The drum should be placed in a room which is comparatively free of much dust, and care taken to keep the air as clean as possible. It is interesting to note in this connection that some of the large commercial laboratories have spent thousands of dollars for the installation of apparatus for washing and filtering the air before it is admitted to the building. The ideal

amateur drying room would be one of cement which could be flushed with a hose a few hours before the film is to be dried. The film is placed on the drum and this is rotated until the film is dry to the touch as explained, it is then polished and removed, but even though spoken of as "dry" the film is not entirely dry and will not be for some days. During the process of development the film stretches and does not return to its original length for a week or more after removal from the rack. This stretching amounts to only a few thousandths of an inch in each frame and would seem to be inconsequential, but it is very important as will be seen when the printing process is described. After thorough hardening and setting it is ready for the printer.

I purposely omitted mentioning the sixteen millimeter film in the paragraphs on development. For the amateur to try to finish his own sub-standard would be pure experimentation, hardly justified, for the finishing is paid for in advance when the film is purchased. However, I shall give the process which was published in the British patent reports, and should some experimenter care to work with it I am sure the Eastman Company will not object, inasmuch as the said amateur has paid them for work which they will not be required to perform. In the first place, the new sixteen millimeter film is said to possess remarkable latitude as compared with the standard film, but nevertheless, the exposure should be carefully calculated. The developer is a hard developer as will be seen by this formula:

Sodium Bisulphite.....192 grains
Hydrochinon .....192 grains
Potassium Bromide.....192 grains
Water, q. s..... 16 ounces

The second solution is:

Sodium hydroxide.....384 grains
Water, q. s..... 16 ounces

Take—

Of first solution..... 24 ounces
Of second solution..... 24 ounces
30% sol., hypo.....192 minims
Formaldehyde .....100 to 200 minims.

Develop five minutes at eighteen degrees centigrade. (Approximately 65 degrees Fahrenheit.) The hypo tends to clear the high-lights, and the formaldehyde is the old familiar hardener, both may be dispensed with, but it is better to retain them. After a thorough washing in running water for fifteen minutes, the film is placed in the reversing bath, not unlike the autochrome reversal bath. The formula is:

4% solution potassium permanganate.. 5 ounces
20% solution sulphuric acid..... 5 ounces
Water, q. s.....100 ounces

If the film is not kept in constant motion in this bath a precipitate of manganese dioxide will be formed upon the gelatin emulsion. The action of the reversal solution is allowed to continue until all of the metallic silver is dissolved. As the undeveloped silver in the film is rendered insensitive by the reversal bath, this process may be completed in daylight. When the

action is complete the film is removed and washed in a two per cent. solution of sodium bisulphite to remove any manganese compounds which may have formed in the film. Five minutes is sufficient. This restores the sensitiveness of the undeveloped silver. Now comes the critical part. Some footage should have been made for test purposes. After the last mentioned bath the film is rinsed, and short strips exposed to diffused daylight and developed. At times there occurs here a second reversal, and if this occurs, bathe for three minutes in a one-tenth per cent. solution caustic potash at a temperature below eighteen degrees centigrade. However, this does not often occur. When the proper printing light has been determined, the film should be run from one reel to another past the source of light, until each portion of the film has received the proper amount of light. Then by proper safelight develop in any good developer. The recommended formula is:

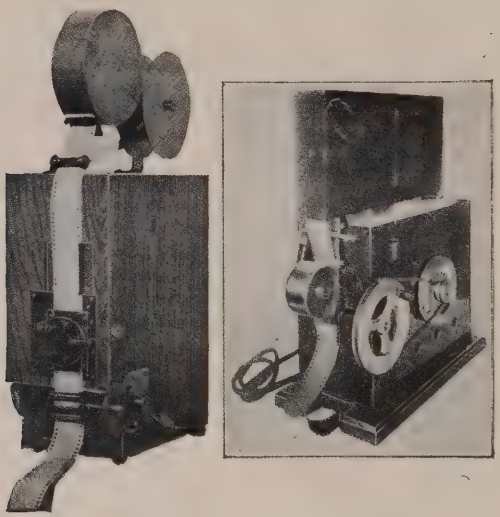
Metol	17.66	grains
Sodium sulphite....	384	grains
Hydrochinon	70.66	grains
Sod. carbonate	38.5	grains
Pot. Bromide.....	7.7	grains
Water q. s.....	16	ounces

After development the film is rinsed and may be fixed in white light. It is then thoroughly washed and dried.

So, if you want to experiment, there you are! As for me, I think that I shall send my sixteen millimeter

film to the factory for finishing. I have developed so much motion picture film that I am perfectly willing to avoid any such drudgery possible.

We shall now return to the finishing processes of the standard gauge film. We left it when we had obtained our dried negative film. Let us hope that it has hardened while we discussed the reversal of the

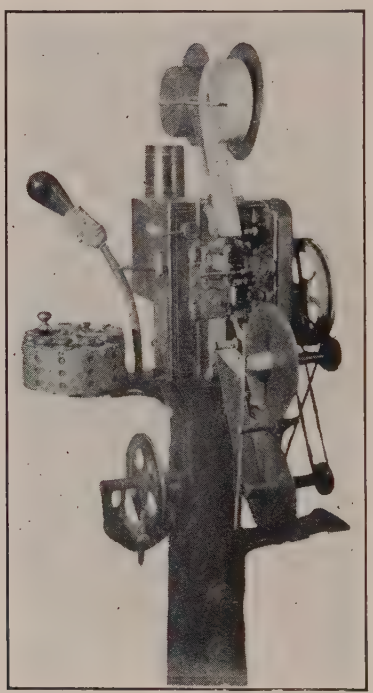


Two types of amateur continuous printers for short strip work

sub-standard film. The negative is now ready for the printer. Motion picture printing machines are divided into two great classes. These are continuous printers and step printers. The continuous printer feeds the negative and the positive stock through a gate and past a source of light, both films moving at a constant, uniform speed. The control of this type of machine may lie in any combination of these factors. (a) The

speed of the machine, (b) the width of the gate slit which admits the light to the film, (c) the distance of the light from the film and (d) the intensity of the light used. As one machine may combine all of these controls, an unnecessary delicacy of control is possible. This would seem to be an admirable type of machine, and when a perfect negative is used, it is entirely satisfactory, but with the exception of one or two high priced machines, the usual continuous printer is made for amateur and short strip use only. This is because of the creeping of the film. Suppose that the negative has stretched one one-thousandth of an inch in each frame. There are sixteen thousand frames in a reel, so the stretching in one reel would amount to sixteen inches! If an entire reel were to be printed this would mean theoretically that the frame would gradually sink and drop from the screen sixteen times in the reel. The frame line would be constantly dropping across the screen only to reappear at the top as soon as it disappeared at the bottom. Fortunately, in practice, it is not so bad as this. First the film is usually printed in two hundred foot lengths or less, and second the cogs on the sprocket wheel tend to pull the two films into alignment, and when they can no longer do so, the teeth ride the film, tear it and the machine jams. I have seen frame lines jump a sprocket hole at a time, however. Despite this, Messrs. Bell & Howell for some years made a highly perfected continuous printer which was used widely in producing professional film, so it may be seen that the difficulties are not insurmountable.

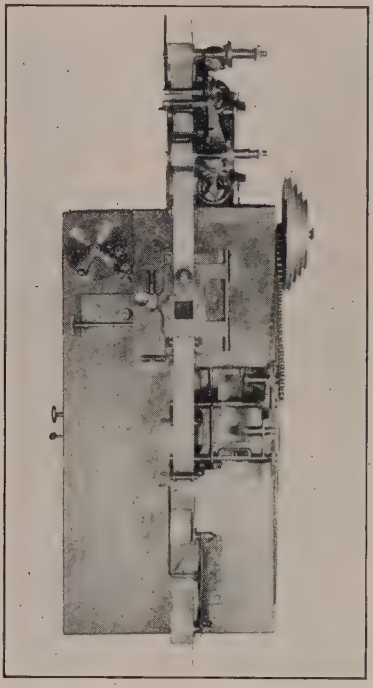
However, the step printer must be acknowledged the superior. In this type of printer, the film is advanced by an intermittent movement just as in the camera and projector. Naturally, as synchronized shutter and intermittent movements are costly, this type of printer



The U. S. Cinematograph printer. This is a good step printer suitable for professional work although it lacks some refinements of the best machines.

is comparatively costly. The film being advanced by an intermittent, and moving freely during the time the shutter is dark, any stretching is compensated for on each frame, and green film may be made to give

a very satisfactory print. The controls of this type of printer are the same as in the continuous type, with the exception of the variable slit. In the step printer, the aperture is fixed and determines the dimensions of the frame on the positive. The intermittent move-



The Moy printer. This is another inexpensive type of step printer which will give professional service. This printer costs about $400.

ments vary, but most of them are either of the Williamson type of claw or some variation thereof, or the Geneva star, the one movement which is used in cameras, printers and projectors alike.

Most of the amateur printers offered at a low price,

that is less than one hundred dollars, are of the hand driven continuous type, and for short strip work, i.e., fifty feet or less they will give beautiful results.

In printing it is well to make test strips a foot or so long, or at least such should be done until you become a proficient judge of film density. This test method will enable you to obtain the best results with a minimum loss of film. Film should be printed so that it is completely developed in four minutes at sixty-five degrees. Some laboratory technicians print a two-minute film and others range up to a ten-minute film. I have tried all of them and I have found that a four-minute film gives what I consider the best projection image. However, this will be a matter for individual choice, but until you are sufficiently proficient to experiment I should advise the four-minute film. I shall mention here the method employed in the large laboratories for printing scenes of various density. A man of wide experience in judging film density inspects the film, and marks the relative exposure on a card and clips the edge of the film with a special clip at the end of each scene. The machine is set by dial or pegs in a switchboard to correspond with the density marked and the film run through the machine. As each clip passes the gate, an automatic switch changes the resistance of the lighting circuit so that the light intensity is changed to the proper degree. Thus one expert can handle a battery of printers whose actual operation is supervised by girls who need have no technical knowledge. These machines cost from one thousand dollars upward.

The developer used for the print is the same number sixteen which is used for negative development, and my standard of four minutes development is calculated for this developer. Of course, there is always the chance to save a poor print by doping the developer, but frankly, I have little faith in such work. I have known photographers good men too, who habitually have a half dozen or so variations of their favorite developer stock always on hand, and wonderful indeed, are the results they claim for doping. They produce beautiful work, and there may be some basis for their claims, but in my hands doping has always been merely a process for saving a very poor film from utter destruction. I have found that there is but one way to obtain good film and that is to make the correct exposure to start with, and this applies alike to both negative and positive. This must then be developed in the proper standardized developer and at the proper temperature.

Serious photographers have always recognized the importance of proper exposure, but the modern film for small cameras has been made so nearly fool proof, and will stand so much abuse that most amateur workers do not know to this day how to judge proper exposure. When a film may be exposed one second or twenty-five seconds on the same subject, and both give really good pictures it is small wonder that this should be the case. However, motion picture film incorporates so many conflicting qualities that latitude cannot be expected in the same degree as is found in still work. In every branch of motion picture work you will find the limitations more severe than in still work, although

the lantern slide man will find himself comparatively at home. This is a good thing. After you have mastered cinematography and can produce good motion film under a variety of conditions, you will have but few failures in still work—if you apply the knowledge which you must have obtained in cinematography.

The positive film is developed, fixed and washed in the same manner as the negative. It is well to use a fairly strong acetic acid hypo bath and to wash in running water for thirty minutes.

Chapter X.

EDITING

THIS chapter will be of little other than academic interest to owners of cameras which use discs, belts or other non-standard forms of film. Such owners may gather hints as to the proper editing of their films during the direction.

After the positive is dry and has been projected it will be seen that the action is rough and ragged. It is very probable also that if there are many scenes that these are out of their proper chronological order, for in making motion pictures it is accepted as good practice to make all of the scenes which take place in one location at one time as this obviates the necessity of redressing an expensive set several times in one production. The amateur will find it convenient to do likewise. The scenes have to be cut anyway to dispose of ends and fog strips, and when the patching is being done the scenes can be arranged in proper order.

Let us return to our scene in which Johnny left the nursery. We will find many frames of the blank wall after he has passed through the door. There will also be a similar quantity of blank stairway before he appears in the next scene. These are not only of no value, but if left in would cause tiresome pauses in the action and render it rough and unfinished. The film should be carefully examined and the last frame in

which he is visible noted. Count down three frames and cut the film there. Then take the stairway scene and note the first frame in which he is visible. Count up three frames from this and cut the film. Join the

It will be found in many cases that the rule of cutting the third frame past the exit will slow up the tempo. In professional work the cutter will most often cut the film just before the exit is complete, and cut the following entrance to correspond. In this method of cutting there is not an instant of off screen time, and this prevents any tendency toward the monotony of an empty set. Care must be taken that the cut is not made so far into the action that the change is jumpy. For quick tempo the cut should be made at the frame line shown between the heavy black lines of the accompanying cut. Do not forget to leave on one strip the tail for scraping and joining.

two pieces and project. Johnny will apparently pass from the room, and smoothly enter the stairway with no pause and no jump. The action will be smooth and the improvement marked. Remember that your settings are merely background; and you must follow your principal actor. If his action is correct and smooth the change of background will appear natural and will not jar upon the spectators.

Should the scenes have been made out of order, the first step is to cut all scenes apart and place them within easy reach. Not until this has been done is the real cutting started. Take each scene and study it carefully. When the important action of a scene is complete, *cut!* Conversely, cut the beginning at a point not more than three seconds before the important action starts. Good direction will make it possible to limit the cuttings to a foot or so at each end of a scene, but it is difficult to direct within closer limits than this. In professional work, it is not unusual to make ten thousand feet of negative to obtain one thousand feet of finished positive. It will be seen from this that the professional film editor is a person of some importance.

As soon as a cut is made, fasten the scene to its predecessor with a paper clip and continue until the reel is complete.

When this is done, the final step is to join the various scenes, or as it is called, "patching." Cut the film about three-sixteenths of an inch or more below the frame line, cutting midway between two sets of perforations. The end which is to be joined to this piece is cut exactly on the frame line. Then, using a piece

The cutting and patching practice gained in editing will also serve in repairing damaged film. The accompanying illustration indicates the method of procedure. First we have a large section of torn film, mutilating two frames. The film is cut between two perforations as shown and the area shaded by vertical lines is scraped free from emulsion. The film is again cut on the frame line below the tear and the two pieces joined, taking care that the superimposed perforations coincide exactly.

Just below the large tear a perforation is torn out, but not badly enough to necessitate the removal of the frame. However, if left in this condition the tear would rapidly increase until the film was torn in two. To repair this, cuts are made as indicated by the white lines. Diagonally into the corners of the two perforations just outside the tear, then along the side of the frame between these two perforations. This makes a notch which will ride smoothly through the projector mechanism without endangering the film.

of heavy glass for a surface and a new razor blade as a knife, carefully scrape the end of the first piece which lies below the frame line. The scraping is continued until every trace of emulsion has been removed, but care must be taken that not enough celluloid is removed to weaken the joint. Then a brush charged with cement is drawn across this scraped bit and the end of the other piece pressed firmly down upon it in such a manner that the perforations and frame lines match perfectly. This will allow the film to move smoothly through the intermittent mechanism of the projector.

The secret of good patching lies in using plenty of cement, but not enough to soil the adjoining film, in rapidly adjusting the two pieces in relation to each other, and finally in a firm and even pressure on the joint. The solution used, although called a cement, is not a cement at all. It is a celluloid solvent, and the joint made is analogous to a weld in metal or vulcanizing in rubber. If a patch is well made, the film will break in a new place before the patch will tear loose. The emulsion on the film is not affected by the cement, and each spot where it has not been removed will fail to join properly.

The utmost attention should be paid to the edges of the patch. If an edge curls up it will catch the mechanism and either tear loose or break the film in a new place. It is not difficult to learn to patch properly, and all efforts expended to learn the proper method of patching will prove to be time well spent.

Learn to apply your artistic sense to cutting as well

as to direction and photography and when you have mastered all three you will turn out master films. It has been said that the success of a picture depends upon good cutting just as much as it does upon good directing and good photography. It is a fact, too, that good cutters, or editors, just about name their own salaries.

The Spoken Title

As the spoken title is in a class by itself, belonging to neither titles nor editing, but rather to both, I shall mention it briefly here. The spoken title is the speech of an actor which is important to the action and which we have no other way of recognizing. As for the photographic technique, it is made as any other title, but no border or art subject is used with it.

When photographing the scene, the actor should be directed to turn slightly toward the camera or in some other way, by gesture or body movement, make it unmistakable to the spectators that he is speaking and that his speech is of importance. In this connection it must be mentioned that all speech between actors before the camera should be appropriate to the action. Many theatre patrons are accomplished lip readers and this faculty is rapidly being attained by countless people in this country. The speech, where a spoken title is to be inserted, should have the identical wording used in the title flashed upon the screen.

In "cutting in" the spoken title, examine the film closely and find the frames where the lips of the actor begin to move. Trace this movement through its course and cut in the title about two seconds before the ter-

mination of the motion. On the screen the actor will make a speech, which we can see is important, then the words will appear on the screen, then the action will be resumed, lasting only long enough to make it plain that there has been no jump in the action, but that it is the direct continuation of the speech and then the action proceeds. Cutting in a spoken title is quite an art, for the proper cut must be judged within a frame or two.

These paragraphs treat of direction, acting, titles and editing. I hope I have succeeded in placing them in a somewhat appropriate position in this volume.

Chapter XI.

HINTS FOR NEWS CAMERAMEN

THERE will be a certain percentage of amateurs who will want to make their cameras pay for themselves. This can be done even more easily than is the case with still photography, for there is not the same competition. There is an active demand for news features, as may be easily seen by watching the material used in the usual news reel. The editors of these reels are more keenly aware of the shortcomings of their films than are the members of their audiences, but one or two reels must be issued each week to fulfill contracts and such material as may be at hand must be used. These editors welcome any usable film and pay at the rate, usually, of one dollar per foot for all usable footage. In the case of foreign news events, this rate is doubled.

The great trouble with the amateur lies in his inability to recognize an event of real importance. You may live in some remote village where John Doe, world famous explorer has his summer home. You are more or less familiar with his appearance and his coming and going causes no more stir than if he were Richard Roe, the village Boniface. Now suppose that Mr. Roe's two story, frame hotel were to burn. You would rush out and make from two hundred feet upward of the conflagration. If you sold it, it would be

for humorous use to show the antiquated fire fighting apparatus used, otherwise your film would be returned. If, however, you make the aquaintance of Mr. Doe, and can obtain a hundred feet or so of him while fishing, hunting, or even pruning his roses, the chances are that you will sell a goodly portion of it. Apply this test to your subjects; would they be of interest to you if they occured at some point a thousand miles distant? And, would they be of interest to some aquaintance of yours whose hobbies and interests are not yours? Would the occurrence deserve a place in a metropolitan newspaper? If the event fulfils all of these requirements, and if your technical work is first class, you will undoubtedly sell your film.

Now as to equipment. You will need a good camera, but because of excessive weight and bulk, the studio models are not advisable. Any good camera fitted to do straight work will serve, although the possession of a dissolve will add a finished touch to the film which the editor will appreciate. The Ertel, Universal, Ernemann, De Brie and others described herein are admirable, while the Ica Kinamo and Sept are very useful in obtaining pictures where the usual camera could not be used. The Sept is unusually useful in following rapidly and erratically moving subjects which could not be kept in the field with the usual pam and tilt tripod.

The lens should have a maximum opening of f 2.9 to f 3.5. The lens of f 1.9 and larger apertures are difficult to use even at small aperture, for although these lenses are wonderful under severe lighting limitations,

in practice it has been found that many of these lenses have a great discrepancy between chemical and vizual foci, necessitating the use of a blue focusing filter. f 3.5 is adequate for all usual work, indeed, you will probably use f 8 and smaller in ninety per cent. of the cases. This lens should be of 50 mm. or two inch focus, as this is the "standard" motion picture lens. If you contemplate photographing events where considerable attendance is expected, and provision is not made for official photographers, a 75 mm. (3 inch) lens may be preferred, as this will give a picture on the film fifty per cent. larger than that produced by the two inch lens, as is known to all photographers. When a second lens is to be purchased if the existing lens is a 50 mm. the second should be a four inch or 100 mm. If the existing lens is a 75 mm. the difference is not worth the cost of the 100 mm. lens, so a 150 mm. lens should be purchased. The 150 mm. (6 inch) lens used in cinematography is subject, in lesser degree, to the limitations imposed upon the telephotographer in still work, in that some quality of focus is lost, but the size of the image compensates for this, where it is impossible to get near to the subject. The third lens should be a 35 mm. lens for work in crowded places, and this may be second choice, according to the usual work which the cinematographer will do. The fourth lens should be one of f 1.9 aperture for interior work without lights, night work and so forth. The foregoing sequence is subject to individual variations, but the above will be advisable for the usual news man. More than four lenses will prove burdensome, and so

rarely used that they are practically useless. In my professional work, I used a 50 mm. and a 75 mm. lens for about ninety-nine per cent. of my work.

The tripod must have a pam and tilt top, for otherwise many subjects would be lost while setting up. With the pam and tilt tripod, the camera is levelled in any horizontal plane and is then ready for work. Also moving subjects can be followed. Usually the pam crank moves about one revolution in five to fifteen seconds, so practice is required to operate the camera crank one hundred and twenty times per minute and with the other hand to operate the tripod crank at six or approximately six revolutions per minute and to operate both smoothly. This is best mastered by practicing with the empty camera as when learning to crank.

The film used is Eastman Standard Cine Film, par speed. In cold weather it is a form of insurance to use the X-back film, which has a coating designed to overcome static. The X-back film costs no more than the usual type. The special films such as super-speed, panchromatic and so on should not be stocked for news work, and in case some special work requires such film, notice is usually had sufficiently in advance to order it speedily. The panchromatic film should be used with a Wratten and Wainwright "K" filter, 1, 2 or 3, and this requires lengthened exposure, just as in still work.

A carrying case should be provided for the camera which is sufficiently substantial to support your weight, and the tripod should have sufficient extension to raise it above the heads of the crowd. Now suppose you

are photographing a parade. Extend the tripod legs to the utmost, set your carrying case behind the camera and within the rear legs of the tripod and stand upon it, thus, even if the crowd surrounds you, you can get your picture. A friendly word of warning will usually keep the individuals in the crowd from knocking the legs of the tripod. If you lose your temper you might as well quit.

In photographing a parade, set your camera so you will get a view quartering into the line of advance. If you attempt a broadside, the individual members of the parade will burst onto the screen, race across it and disappear before they can be seen by the spectators. If, however, you quarter *into* the line of advance, units of interest may be seen in advance and followed, and at the same time any given unit will remain upon the screen several times as long as in a broadside. A third reason for quartering has its basis in psychological law. When we observe any object we observe it first in mass, and then little by little we observe units of detail and finally the individual detail. We can observe the mass while an object is in the distance and as it comes closer to us we have a development of detail, just as we would in observing any object in life, so that in reality we lose nothing by first observing mass in the distance.

When photographing races this is also important in that at a given distance from the object and with a given shutter speed, there is far less blurring in a quartering view than in a broadside. In photographing a speeding express train, a passable photograph can be obtained with a box camera working at about 1/25

of a second, provided the picture is made approximately head-on. Remember this principle in your motion, work with fast motion.

Usually focusing must be done prior to the beginning of action, in the case of parades and similar action. The news man usually focuses by scale, and when the light is strong enough sets his diaphragm to obtain sufficient depth to have all objects in focus. Below is a table of hyperfocal distances for the 50 mm. lens. Everything from one-half this distance from the lens to infinity will be in focus sufficiently sharp for practical purposes.

f 1.9	.....70 feet
f 3.5	.....40 feet
f 4.5	.....30 feet
f 5.6	.....24 feet
f 6.3	.....22 feet
f 8	.....18 feet
f 16	.....10 feet

Thus, an opening of f 4.5 is entirely practical for street scenes, as everything from fifteen feet to infinity will be sufficiently sharp.

When photographing a single individual, fill the frame with him. If it is a man in public life making a speech, cut him at the waist or thereabouts, but allow sufficient room so that he cannot fling his hands out of the frame. Later, if you can, get a close-up, with your subject looking squarely into the lens and talking. However, do not get too much of this. Ten feet directly into the lens should be enough. Many news men

follow the practice common in studios of having their subject look anywhere *except* into the lens. In the inexperienced subject, this almost always gives a sense of furtiveness which makes the spectators uneasy. However, if he looks squarely into the lens an instant, the psychological inhibition will be removed and he can and will look away quite naturally with no indication of conscious avoidance of the lens.

Have patience! Keep with your subject, when photographing a personage at work or at play, until he is used to the presence of the camera, and then get your film while he acts naturally.

News work is not essentially sensational. One news company issues a handbook for free-lances in which it states that pictures of animals, babies and pretty girls are always most acceptable. If you are going after physical pulchritude, go to the beach and get your beautiful mermaids in bathing suits. Remember that bathing suits made Sennet famous.

If you care to go after babies, remember that the baby in soiled clothes with a cheerful grin half obscured by jam will probably win the medal. If you can't get the grin get a squall. The beautified, curled and immaculate youngster is out of the running. The news reel wants laughs. Immaculate kiddies can be seen on any street any day, but the human youngster, dirty and heated from play wins the sympathetic smiles from passers-by.

Animals are good, from prize dogs in the show to a field mouse taken in the fields. Wild animals, on the whole, are better than domestic ones, because good

wild animal pictures are rare. If you doubt the taking power of animals obtain information as to the net proceeds from the Johnson or Rainey African pictures. If you are in Florida, remember that to the bulk of the nation an alligator is as rare as a lion, or if you are in Oregon, the same applies to a bear.

In submitting your work to the news editor, enclose in the box, but not in the film can, a report which gives the scenes in chronological order. If personages are present, name them invariably from left to right. Give exposure, diaphragm, light, camera used, footage. Enclose in a film can, enclose can in a strong box and mail special delivery the same day as exposed. It is a good plan to have the can and box all ready. Carry a changing bag, and as soon as exposed, place magazine and can in the changing bag and make the transfer. Then the next day send in a copy of the report with newspaper clippings if any are available. The news company will develop your film, and if unacceptable will return it to you. It has been my experience that their washing is anything but thorough, so if you want to preserve your film, wash it as soon as it is received. If the film is accepted, of course, the negative is retained for the files of the company.

Review work is quite different from news work. It bears approximately the relation to news work that magazine articles do to newspaper items. Briefly, they are of general, rather than of timely, interest, so that a good review film would be as valuable a year from now as it is today. Review articles consist of travel pictures, scenics, popular scientific notes, animal,

baby and girl pictures. The scenic is a good source of income, but the cinematographer must have his artistic sense as fully developed as that of the successful pictorialist. The scenes must be really beautiful, even if they possess an unusual degree of novelty. Another thing to remember is that you are making *motion* pictures. The best way to obtain motion is to introduce a figure. The human race is egotistical. The man and woman in the theatre like to see others of their kind. However, this figure must be appropriate to the scene. You should not introduce a woman in smart Fifth Avenue costume in a scene laid in the Canadian wilds. It would be far more sensible to use the Indian guide. Also, do not have your figure conscious of the camera. Have your guide walk into the picture with a pack on his back, and stop to rest, gazing at the scene which is being photographed. I once saw a lengthy and very beautiful scenic woven about the wanderings of a minstrel in the Scottish Highlands.

If you have a factory in your neighborhood where some article of common use is made, you can with a little ingenuity obtain up to five hundred feet of the salient points of manufacture, and the film will usually sell. If you are a worker in some scientific or other highly specialized work, remember that your work is unfamiliar to the public in detail, but that its results are probably important in everyday life. A motiograph of this work will prove interesting. In this work do not pad, do not include operations of no interest or which are approximated in other lines. If you are photographing the work in an automobile factory, do

not photograph the man using a file. We all do that, but few of us have seen the delicate and almost human operation of an automatic lathe. Grab that!

Hunting and fishing pictures are good. Dogs in the field should go fine. Trained animals are not so good, but something exceptional would go. Travel pictures are good if you can get native types without apparent consciousness. This involves a point which the news photographer must watch in both news and review work. Mr. Common Man, when he sees a camera wants to stop and grin foolishly into the lens. He also wants to slow down and hog the screen. A good natured chaffing will usually win the crowd for you and keep them on the move. This requires more tact than any other part of your work.

In foreign fields, especially, be sure that there are no official objections to the use of the camera. Prior application will many times obtain official permission to photograph where unauthorized photography would result in prohibition or even confiscation of your camera and film.

Chapter XII.

TRICK WORK

ALTHOUGH the highly complex multiple exposure effects used in the large studios are hardly suitable for the amateur, there is a considerable amount of trick work which can be easily done by the average amateur and which will be a source of amusement to all your spectators.

The first thing to do is to construct some kind of a shadow box. This should set about three inches in front of the front surface of the lens, and be large enough that the sides do not encroach upon the frame. Thus it can be used as a lens shade when not using any filters or masks. A good way to construct such a shadow box is to obtain a small wooden box with a sliding cover. One which will take a two and a quarter by three and a quarter plate will do very nicely. Cut a circle in the bottom which will just slip over the lens barrel or the existing sun-shade, and which fits firmly enough to maintain the box in its position without any movement. In case you want a little better construction, have a metal barrel turned which will fit over the lens barrel and then have holes drilled around one edge and screw this barrel into the wood of the box. With such a fitted shadow box, it may be removed and replaced with some assurance that the registration will be maintained.

The reason that ultra fine registration is not necessary is that, as the masks lie in front of the lens some two to three inches, the edges of the masked opening are diffused.

Next make your masks, using glass plates for this purpose. These must be made in pairs in such a manner that when a pair of masks are held to the light, one superimposed on the other, all light will be obliterated. Thus, if an opening is left in the upper left hand corner of a mask, the corresponding mask would have only the upper left hand corner darkened. Likewise, the double exposure masks should have the right and left halves respectively darkened. Masks for triple exposure are the same except that each mask has one portion light and both other portions are dark in the corresponding masks. For example, it being desired to expose three vertical panels on a frame. Mask number one has the left third open and two thirds dark. Mask number two has the center open and both sides dark, while mask number three has the right third open and the other two thirds dark. By following the same principle, a mask may be made to introduce a double exposure in any portion of the frame. For temporary masks, such as will be used but once, ordinary opaque, such as is used for retouching purposes, may be used, or if the mask is to be handled a great deal, the blocking out may be done by applying ordinary adhesive tape, cut to shape.

When the shadow box and masks are ready for use, some simple tricks may be tried. One which is an invariable laugh producer, was introduced by my first

cine-chief, Sam Landers. In using this trick, if you can obtain a very fat man, the effect is greatly heightened.

Set one leaf of your double exposure mask in the shadow box and focus on some scene where a very slender pole or young tree will be exactly bisected by the edge of the double exposure mask. A clothes prop is very good, but it must be exactly vertical, or a pair of vertical masks must be made whose edges slant at an angle corresponding to the leaning of the pole. Also the pole must be fixed so that it will not waver when touched. A small telegraph pole can be used, but it spoils much of the effect.

When the camera is set, have the fat man run into the open side of the film, run behind the pole and stop. Then have him peer around the pole just as though he were looking around a corner. This will, of course, appear absurd, but carry it through, nevertheless. Then have him walk very slowly from behind the pole and into the open side of the frame again, swaggering, and walk off the set in the same direction from which he came originally. Now cap the lens and reverse the camera until the film is in the same position it occupied at the start of the picture. A good way to check this is to open the camera and notch the film just above and below the gate, or if the lens is readily removable it is even better to remove the lens and mark the emulsion exposed with a pencil. Then when the film is rewound, open the lens plate and see that the same frame is in the aperture. Now insert the other side of the mask, of course, first removing the first mask, this will leave

the second side of the frame open, and run the film through the camera, being sure that diaphragm opening and light are the same as at first. Merely expose the film on the empty set. Now remove the film and finish it. In the projector the following is the effect:

The empty set appears with a pole standing in the center. A fat man runs in, looking behind him as though pursued. He runs behind the pole, but instead of passing into the opposite side of the frame *he disappears!* It is just as though he lost enough substance to hide behind the pole. Now his head is thrust from behind the pole, he looks around and slowly walks into view again. It is, indeed, laughable to see a fat man materialize from the cramped space behind a two inch pole! He then swaggers off the screen. It is impossible to convey the effect produced by mere words, but if you produce such a film successfully, it will be a strange audience, indeed, which will not indulge in a hearty laugh at the sight of this strange procedure, especially if the actor is well known to the spectators.

The flying angel is another simple trick. Expose a strip of film on some trees, obtaining considerable foliage, or if some special location is desired, anything will do as long as it is rather dark and lacks foreground. Detail does not matter, in fact, a wealth of detail in the background helps the effect. Now take the camera indoors, and turn it upon the tripod head so that the tilt instead of moving the camera in a vertical arc, moves it in a lateral arc. Crank the tilt until the camera sets at an extreme angle, and focus upon a female subject clad in light, filmy drapery. Have a fan

set so that it will blow the drapery back against and behind the body. Observe the finder and see that the subject's face is toward the bottom of the *frame* or as all images are inverted, toward the *top* of the *aperture*. The subject should be placed before a large doorway, which is of such size that no portion of the frame appears in the picture, and a dead black drapery should be hung behind her, with no wrinkles. Now expose the same strip of film which already has the image of the background upon it. When finished the film will show a transparent, but easily recognizable figure, floating in midair, in an oblique position, with draperies fluttering in the air above her. The effect will cause a great deal of comment.

We are all familiar with the scenes in which a ghost figure gradually appears upon the screen, and then disappears without walking off the screen. To obtain this effect both trained actors and fading are essential. By a trained actor I do not mean, necessarily, that a professional be employed, but one who has had sufficient training to follow direction implicitly.

Expose on your set in the usual manner until the time for the appearance arrives. At this point direct all actors on the screen to freeze, that is remain absolutely immobile, in some position which will appear to be natural, then fade out, noting the exact reading of the film meter at the beginning of the fade. As soon as the fade is complete, rewind to the beginning of the fade, and direct the "ghost" to take his place and to remain immobile. During all of this time all other actors must absolutely retain the "freeze." Then start

cranking and fade in immediately. The fade out and fade in must be exactly superimposed or the effect will be spoiled. When the fade *in* is two-thirds complete, direct all actors to resume action, which is then carried through normally until time for the disappearance. Then have all actors except the ghost freeze. The ghost should take up some action during the fade out to relieve the deadness of the rest of the scene. Fade out, have the ghost leave the set, reverse to the beginning of the fade out, and fade in on the set and continue the action. The reason for the freezing is this: The film is faded out on the set at first, and the image of all actors grows progressively fainter. Then on the fade in, these same images grow stronger in direct proportion, and if any actor moved, it would cause a blurred image, for the *two* images of this actor would not exactly register. For this reason, most of such scenes are made with only one or a very few, well trained actors on the set. The two fades so exactly compensate each other that no effect is noticeable except for the ghost, whose image gradually fades in and later fades out.

Visions are made in a different manner. Let us suppose that a smoker is to see a vision in the smoke. First arrange some effect for the production of dense smoke. A proper choice of tobacco will do this if pipe or cigar is used. The cigarette does not produce enough smoke. Have the set free of draughts. Then note the approximate proportions of the smoke cloud. When the exposure is to be made, make a temporary mask to mask out this cloud and take care that the cloud of

smoke is approximately the size and shape of the original. Make the exposure with this mask in place. A wide variation in the smoke cloud is permissible as long as it was approximately correct at first. When the exposure is complete, rewind the film, make the corresponding mask and make an exposure on your vision and develop the film.

It will be noted that the first exposure may be a close-up of the smoker and the vision may embrace a wide landscape. There is no fixed relation between the relative areas embraced, in distinction to the ghost, where the visionary figure fades in, takes substance and acts in correlation with the other actors.

The vision proper should always fade in, but it may either fade out as in reverie, or it may disappear if the dreamer is startled. In fading in, the process is the same as in fading in the ghost, that is by fading out, reversing, inserting mask and fading in, noting film meter at both ends of the fade. Then on the vision, this is exposed by fading in on the film exactly corresponding to the fade in on the mask. If the vision fades out, the fade is operated with the mask in place, camera reversed, mask removed, and the fade in exposed on top of the fade out. And in the vision exposure, it is also faded out to correspond with the fade out on the mask. It will be noted that the entire exposure of the mask exactly corresponds to the exposure of the blocking out mask.

If the vision is to disappear with a jump, when this point is reached merely stop the camera, note reading of the film meter and remove the mask. Then

resume direct action. In exposing the vision, be sure to stop short when the film meter shows this point or you will have a transparent "ghost" vision with the background showing through. In this method, when the film is projected, the vision will suddenly disappear from the screen with no fading.

This work requires the utmost delicacy of operation and a film meter which shows individual frames ex-

This shows a print from a negative which was exposed for trick work, but upon which the second exposure was not made. The second frame has the approximate blending line of the two exposures indicated by a white line, while the third frame shows the actual shape of the mask used.

posed. If you have no such device, you can follow the method used by cinematographers when some circumstance or other prevents fine workmanship. Fade in on the mask and fade out in the usual manner. When making the vision exposure, do not fade in until the meter shows from one to three feet past the first fade, and fade out a corresponding time *before* the beginning of the fade out on the mask. Projected this will show a blank white space fading in on the screen, but before it is clear in, a picture fades in on this space. When fading out, the picture fades leaving the white space which itself begins to fade before the picture is entirely gone. This effect is easy, even with a hand operated diaphragm fade, and is infinitely superior to a poorly made exact register fade. In fact, many producers who employ cinematographers entirely competent to perform an exact register fade, insist upon the second method as being more artistic.

If multiple visions are used, such as the scenes of boyhood passing successively before the eyes of a man, the mask is faded in at the beginning of the first vision and out at the end of the last vision. The individual visions are then successively faded in and out in the white space made by the mask.

There are times when the true ghost effect is to be desired. In this effect, the figure fades in, but instead of taking substance as described in the ghost effect described above, the figure remains transparent throughout the entire action, and no "freezing" is required. This effect probably requires more care with settings, but far less camera work than any other. The

scene is photographed in its entirety, the only care being to note the reading of the meter when the ghost is desired to appear, and again when the time comes for him to disappear. When the scene is exposed, the lens capped and the film rewound until the meter indicates the position of entry. The ghost is now posed against dead black drapery and the exposure made, fading in and out at the beginning and end, respectively, of the scene. The figure should be made to appear in some part of the scene which is comparatively dark. This is merely for the sake of the contrast obtained. For the same reason the figure should be light. When this film is projected the figure will fade in and move about the screen, but at all times the furniture and portions of the set behind him, can be seen through him.

If you do not care to try fades, you may use this effect anyway. Follow the directions as given above. The only difference is that when the film is rewound to the desired point, pose your ghost and start cranking, stopping when it is desired to have him leave the set. In this effect, the ghost will suddenly appear and when his action is complete he will suddenly vanish.

This effect may be obtained even by those who have no reverse on their cameras. In this case when the first scene is exposed the camera or magazine, according to the make of camera, is taken into the dark room and the film rewound by hand. The film is then run through the camera behind a capped shutter until the meter indicates the desired footage and the second exposure is made. This is possible in this case because there are no fades to match in the two separate

exposures, and if the ghost appears or disappears a second or two before or after the calculated time, the film is not injured.

The following is a good effect for comedies. Start a chase, such as was common in the old time comedy. Let the crowd of pursuers almost catch up with the pursued. Then the pursued turns upon the pursuers and they hesitate. As they hesitate the pursued disappears only to reappear after a moment, in the distance. This is accomplished in this manner. When the pursued stops and turns upon the pursuers, stop the camera short, remove the pursued from the screen and resume cranking while the crowd stares about in puzzlement. Then stop and have the pursued take his place in the set at some distance from the camera and start running away from the crowd. Start the camera, have the crowd see him and take up the chase.

Another trick which depends upon manipulation off screen without any camera manipulation, is the effect of dishes or furniture moving without any visible force being applied to them. If the background is somewhat variegated and rather dark, very fine wire or thread may be attached to various articles and by this means they may be moved without the thread or wire appearing on the screen. Using different variations of this trick will enable the amateur cinematographer to obtain various startling effects without the necessity of trying any involved and complex camera manipulation.

One trick which is very effective appears like this:

A man sits in an easy chair dreaming, and as he dreams a girl materializes upon the chair-arm and while there engages in appropriate action. This trick requires the utmost care in making, but if carefully done, the effect will repay you for all your trouble.

Expose the original scene by straight photography, but see that the background behind the chair-arm is absolutely black, and with no visible detail. At the end of the scene, do not move the camera nor the chair. The actor may leave if he wishes. Now insert a ground glass in the aperture and very carefully mark the exact outline of the chair arm. Use a very finely pointed pencil for this purpose, and leave the glass in the aperture. Now take the camera to some place where the subject can be posed against black drapery. Next, using a mask in the shadow box, block out all of the frame except that which will receive the image of the subject. Now the most important step is to be done. While observing the chair-arm outline on the ground glass, direct an assistant who will mark on the floor a faint line which exactly corresponds with the chair-arm outline. Now fade-in on your subject and make the exposure, being sure that the subject remains walking within the outline marked on the floor. The floor should be covered with black to match the background. The comparative sizes should be such that the miniature subject appears to be about eight inches tall. When removing the camera to make the second exposure, it must be set far away enough from the subject that this size is obtained. This will make the lens include many extraneous objects, and

for this reason, a mask must be used which will block out all of the film except the tiny area in use, but be sure that enough space is included to embrace all necessary action.

I have, in these instructions, emphasized freezing, solid black backgrounds and so forth. You will not notice these things in many professional pictures, but you must remember that an inexhaustible fund of cash, the most expert technical workmanship supplemented by the combined experience of a generation of professional cinematographers enable them to split seconds in timing, and by the utmost delicacy in technique, the obvious actions necessary are either rendered unnecessary or inconspicuous.

I have seen Japanese embroideries which rival a fine painting in delicacy of execution, works of art which I could never hope to duplicate. In like manner, do not despair because you have to incorporate certain crudities in your films. As a beginner you cannot hope to rival the technique of the master cinematographer. Too, you must remember that he has for his assistance, a corps of competent artists. I do not mean photographic artists, but finished draughtsmen, sculptors, and so forth. The artists make miniatures and backgrounds with the utmost fidelity. The sculptor models figures, pots, architectural detail, constructs miniature sets and so forth. A given set can be duplicated with the utmost fidelity. Backgrounds can be matched, with any desired discrepancy in size desired. In short, every assistance which a wide variety of technical skill and unlimited money can secure,

is ready for the assistance of the cinematographer.

Make your films. Do your trick stuff. If it is crude compared with professional work, remember that the artist, if he is sincere, is the first to appreciate the shortcomings in his work. Your films will very probably be fully appreciated by your audiences. To them a crudely made vision will appear wonderful and the cinematographer will receive much sincere praise.

As you proceed with your work, variations and refinements will occur to you, and with progessive work, you will gradually attain a finished technique which may, if you so desire, eventually secure you a position behind the crank in a large studio.

Chapter XIII.

STOP-MOTION WORK

THERE are two variations in speed in motion picture work which greatly enlarge the scope of cinematography. These two variations are known as "Slow-motion" and "Stop-motion." The great similarity in the two terms leads to great confusion.

Slow-motion, or as it was originally called "Motion Analysis," is made by exposing the film at great speed, from five to thirty times as fast as normal. This results in a picture which when projected, slows down all motion to such an extent that a man leaping into the air rises as though buoyant, and sinks to the ground as lightly as a feather. Examples of this work are fairly common in news and review work, but so little taste has been exercised in selecting subjects that these pictures now pall, unless of exceptional interest.

The great speed with which the film moves through the camera is so hard on both the film stock and the intermittent mechanism, that unless a special intermittent is used, both film and camera are endangered. Owing to this fact, this work is not practical for the amateur, but the opposite effect, or stop motion is very easy and is capable of rendering very fascinating effects.

Stop-motion is not, as might be thought, a rapid rendition of the picture, but is a process whereby dolls and other inanimate objects exhibit action. Cartoon

work, although beyond the power of the usual amateur, is based on stop-motion work.

The simplest example will be doll work. The set is first constructed, its size being regulated by the size of the dolls used. Do not try to imitate reality in the set. An extremely simple or extremely fantastic set is best, as the obvious artificiality of the set helps the effect greatly.

Now dress your dolls in the costumes which are to be used. Set them in position for the opening scene, and focus the camera. Insert the crank in the single crank opening, and when all is ready expose a single frame. After a short interval, expose another frame, and do this until six frames have been exposed. Develop this film to see if the exposure is correct. It will be noticed that in this work the exposure can be made any reasonable length, even up to one second, so that indoor work is practical even when using lights of comparatively low intensity.

Experiment until the proper exposure is obtained. This should be done in two or three trials. After this primary experimentation, no more such work should be necessary. If the various constants, such as distance, lighting and so forth are maintained the results will remain constant.

Now, begin again. Expose a single frame. Then move the arms or legs of the dolls a very little, and expose another frame. Repeat this process through the entire action. A step should occupy from one-half to one second. Divide the entire motion into eight to sixteen parts and move the limb through this part at each exposure.

Care must be taken that all action is carried on. That is, Number One will take a step while Number Two starts to raise an arm, both of these must be carried on at the same time. In this work the exposure will take about one second, and the inter-exposure arrangements will occupy about fifteen seconds at first. This means four frames to the minute, or two hundred and forty frames an hour. These two hundred and forty frames will occupy fifteen feet of film, and will have a screen time of fifteen seconds. A ten minute run is about the minimum run for an interesting playlet, so this will require some forty hours of hard work. True, it takes effort, but the result repays you. This is the method employed in making cartoons, but in that work, the cartoon must first be drawn, and each successive drawing must be an exact duplicate of the preceding except for the moving parts. By the use of transparent sheets and other devices, this cartoon work is somewhat simplified, but a detailed explanation of cartoon work would fill a volume in itself.

A very interesting variation of stop-motion work is used in scientific work. A plant is placed within a screen which protects it from air currents, and an exposure is made at intervals of a half minute, five minutes, fifteen minutes, or whatever it must be. This interval is determined by a calculation of the length of film to be used and the duration of the total time which will expire. By this method a plant can be made to thrust up the ground, grow, bud and blossom before our eyes in five or ten minutes.

Many variations of this work will occur to the ama-

teur, and if an exceptionally good or unusually interesting strip of stop-motion film is obtained, if standard gauge, it can be sold at a price considerably higher than that paid for ordinary news work.

Chapter XIV.

THE SCRIPT

THIS chapter is in the nature of an appendix, but personally I believe that the habitual use of a script will prove invaluable in saving both film and temper.

Film costs hard cash, and all amateurs will wish to avoid unnecessary waste. No film should be exposed on domestic playlets unless some definite plan is followed. Each scene should be a definite unit in the whole. To make it so, the scene itself must include certain action which when incorporated into the finished film will form a smooth continuity. When the attempt is made, especially by an inexperienced cinematographer-director, the result is almost inevitably the omission of some action which is essential to smooth continuity. The possession of a working script obviates this error.

The script, or continuity as it is also called, should not be confused with the scenario. The scenario is a literary work and cannot be produced by an author inexperienced in photo-dramatic technique. The scenario is drama just as surely as the orthodox form of dra-

A study of the technique of photoplay writing will do much to give the cinematographer an idea of dramatic unity and other dramatic requisites. For the cinematographer who is to be his own director, I should most earnestly advise a study of Wright's "PHOTOPLAY WRITING"—Falk Publishing Co., N. Y.

matic literature. The script is merely brief working directions.

As example is ever superior to instruction, I shall give an example of a simple script. We shall follow The Browns.

THE SCRIPT

Title 1 THOMAS BROWN
presents
THE BROWNS

Title 2 CAST OF CHARACTERS
Mother.....MRS. MARY BROWN
The Infant....JAMES BROWN, JR.
The Dog.....ROVER BROWN

Title 3 THE BROWN MANSION
Pikeville, Iowa
September, 1st, 1924

Scene 1 Fade in. Long shot of the Brown home seen from the road. Cut to

Title 4 JAMES VENTURES INTO THE WORLD

Scene 2 Full shot. Front door of Brown home. James comes from door followed by Rover. He toddles to the gate and starts down the street. Cut to

Scene 3 Long shot. Street. Workmen digging a ditch in the distance. James walks into distance toward workmen with Rover following. Cut to

Scene 4 Full shot. Workmen in foreground, James advancing from distance. He comes and stands watching workmen who chaff with him. Cut to

Title 5 NOON
Cut to
Scene 5 Steam whistle with steam streaming from it. Cut to
Scene 6 Workmen stop, listen, speak to each other, drop their tools and leave. James looks after them. Cut to
Scene 7 Semi close-up. James looks after the men, then at the ditch. Cut to
Title 6 ADVENTURES TO THE ADVENTUROUS
Cut to
Scene 8 Full shot. James climbs over the dirt pile and drops into the ditch where he plays. Rover stands on the brink of the ditch and wags his tail. James tries to coax him into the ditch but Rover refuses. Cut to
Scene 9 James playing in the ditch. Another angle.
Cut to
Scene 10 Close-up. Rover barking. Cut to
Scene 11 James looks up at Rover. He gets to his feet and tries to climb out but fails. He begins to cry and Rover barks excitedly.
Cut to
Scene 12 Close-up. James crying. Cut to
Scene 13 Close-up. Rover barking. Cut to
Scene 14 Full shot. Rover barking in excitement at the edge of the ditch from which James vainly attempts to climb. Cut to
Scene 15 Rover turns and runs at full speed in the direction of the house.
Fade out and into

Scene 16 The Brown Sewing Room. Mother sewing by a window. Rover runs in and jumps about her excitedly. Cut to

Title 7 THE SUMMONS
Cut to

Scene 17 Same as 16. Rover tugs at Mother's dress with his teeth. Mother looks at him puzzled. Gets up and Rover runs in front of her. Rather anxious because James is not with Rover, Mother follows him. Cut to

Scene 18 Long shot. Brown home, Rover comes out followed by Mother. He leads her to the front gate and through it. Cut to

Scene 19 Long shot. Street. Rover advancing from distance followed by Mother. Ditch in foreground with James' grasping fingers visible above the edge. Cut to

Scene 20 Full shot. Ditch. James' head visible, tears streaming down his face. Rover comes to the edge and barks in excitement, turning to look back. Cut to

Scene 21 Street. Long shot. Mother running toward ditch. Cut to

Scene 22 Ditch. Full shot. Mother comes to edge of ditch and looks down. Cut to

Title 8 THE RESCUE
Cut back to

Scene 22 (Con't) Mother reaches down and lifts James out of the ditch. He clasps his arms about her neck and sobs with relief. Cut to

Scene 23 Close-up. James and Mother. Cut to

Scene 24 Street. Long shot. Mother walking toward house with Rover following. Cut to

Scene 25 Brown home. Long shot. Mother with James enter gate followed by Rover. They cross the yard and enter door. Cut to

Scene 26 Doorway of Brown home. Full shot. Mother and James enter. Rover follows. He stops in doorway and looks back.

Fade out and into

Title 9 THE END Cut

Such a continuity is not difficult to prepare and will render the work of the cinematographer much easier. All of the shots on one location will be taken at one time, and the titles made after the film is complete. The scenes are then joined in proper order. It will help to cross out the scene number with a checking pencil when each scene is complete, and thus avoid the confusion which might result in making the scenes out of chronological order.

Chapter XV.

PROJECTORS AND PROJECTING

WHEN, by the aid, or in spite of the foregoing chapters you have obtained a film ready to show, you come to the last step in cinematography, and one which many cinematographers know little of. This is projection. In professional work the projector is a man who has specialized in this branch of the work and rarely, indeed, does the cinematographer project his own film, but the amateur must add to his dual role of director-cinematographer, the third part of the work, projecting.

The variety of projectors offered is if anything wider than that offered in cameras. Projectors may be briefly classed as follows: (1) Professional or theatre projectors; (2) Semi-portable of school type projectors; (3) Portable or lecture projectors; (4) Home projectors; (5) Sub-standard projectors and (6) Toys.

The Professional type of projector is a bulky machine which may stand some six or seven feet high and weigh a half a ton or more. The usual type is about six feet high. The light is an electric arc for

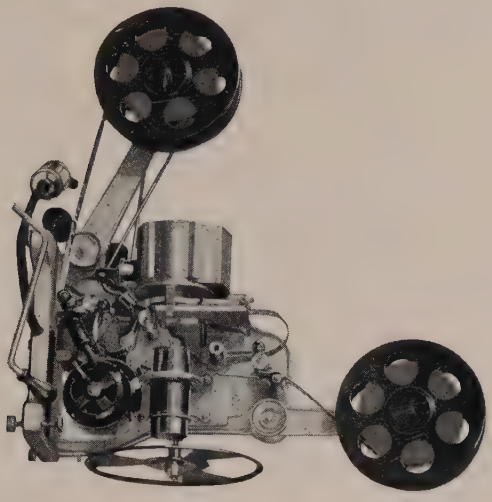
A detailed exposition of the complete art of motion picture projection would require a volume in itself. Among the best treatises of this subject is "MOTION PICTURE PROJECTION," by T. O'Conor Sloane, published by the Falk Publishing Co., N. Y. It is well worth reading by everyone interested in cinematography and projection.

long throws, and a special concentrated filament incandescent lamp for smaller theatres. The unit machine consists of a retort and receiver magazine, intermittent movement, fire gate, lamp house and supporting standard. The refinements include motor drive, automatic speed control and indicator, metal housings for all moving parts, stereopticon attachment for showing lantern slides and so forth. The light is movable in relation to the lamp house and the whole lamp house moves forward and back. The projector runs forward only, and there is a metal door which drops between the light and the film when the machine stops. This is necessary for the standard film is highly inflammable and the intense light used would ignite the film instantly if allowed to strike it while it was not in motion. Sometimes even the slight fraction of a second which it is exposed to the light in projection is long enough and the film ignites in running. For this reason fire-proof booths are required by law in all places where a professional type of projector is used.

The professional operator must understand the adjustment of his light, of the condensor lenses, and the adjustment of the mechanism. He should be able to catch the end of the broken film and keep it running through the projector without interruption. He should be able to adjust the frame to the aperture before starting the machine and should have his lens focused before the exhibition starts. The trained operator has his hands full while at work, and the professional projector would prove entirely impractical for amateur use, although its cost is not great. A very good pro-

fessional projector will not cost in excess of one thousand dollars and many theatres use projectors which cost three hundred dollars or less.

The semi-portable type is a small edition of the professional type, but some of the adjustments are fixed, and the operation is simple enough for the ordinary school-teacher to learn to operate it without trouble. This type of projector usually has an incandescent lamp



The Pathescope projector, one of the most highly perfected home projectors ever manufactured

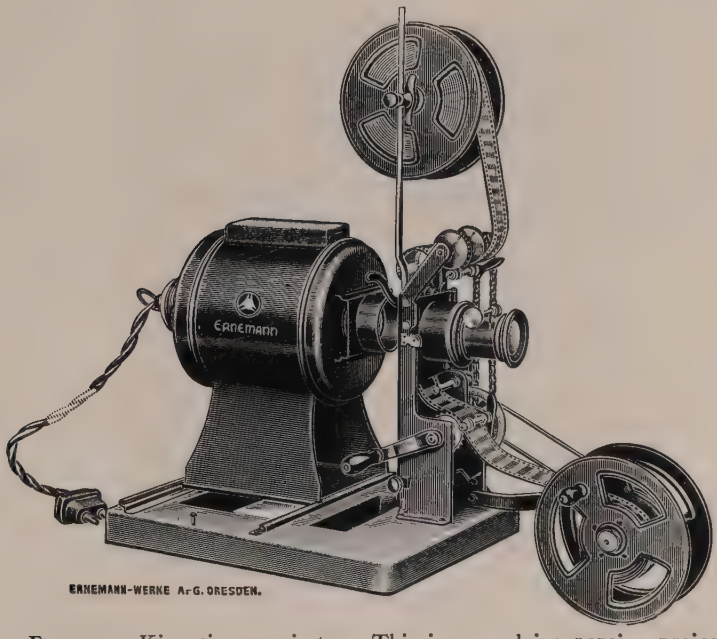
and motor drive. It usually has fire trap throats on the magazine so that if the film ignites only that portion will burn which is exposed between the magazines. However, they are licensed for use with standard film only with an enclosing booth.

The portable projectors are getting into the real amateur class. They usually resemble a small suit-case

and are self contained, including a motor for driving the mechanism. Many of these projectors, designed for short throws, that is up to forty feet, have the lighting and optical systems so arranged that the projector may be stopped and a single frame projected without danger of igniting the film even though the inflammable film be used. Some have in addition a reverse movement which will project the film backward. This type of projector is often used by film editors in editing the film as a scene may be projected repeatedly without removing the film from the machine. These machines have a capacity of a full one thousand foot reel and cost from one hundred dollars upward. Good used machines can be purchased for considerably less than one hundred dollars. These machines are licensed for use with non-inflammable film, but they are so nearly fire-proof, owing to their closed construction and the comparatively weak light source that they are widely used with inflammable film.

There are a number of home projectors on the market, which are of a skeleton type, resembling the old time theatre projectors but which project very well, indeed. The first of these to meet with any great popularity was the Home Pathescope. The usual projector has a shutter divided into four parts. Two of these are open and two closed, so that the light is permitted to pass approximately one-half of the time. The Pathe has a very rapidly moving intermittent which allows the shutter to be open somewhat more than two-thirds of the time, and this materially increases the illumination from a given light source.

The shutter used on this projector has three blades and three openings. A comparatively weak illuminant will give a brilliant image. This projector is made to take the Pathe Safety Standard film which is coated on non-inflammable base, so that it can be used in the home without infringement of the insurance regula-

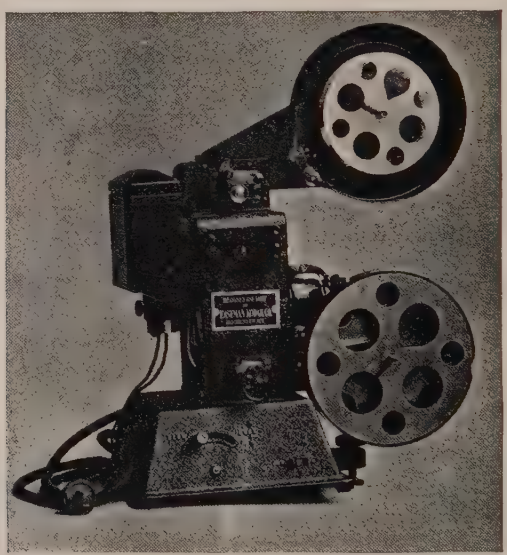


The Ernemann Kinoptican projector. This is a good inexpensive projector using standard film. It is similar to the Ica and Hall projectors

tions. If desired, this projector can be obtained in a cabinet which closely resembles a console model phonograph.

The Ica home projector is extremely simple and uses a low candlepower lamp close to the film. This projector uses standard film, but owing to the small

size of the lamp, there is slight danger of igniting the film. The projector is extremely small and easily portable. It can be stored away in a small space and is entirely practical for home use. It is provided with five hundred foot reels, but one thousand foot reels can be used. It is used in hand or motor drive.

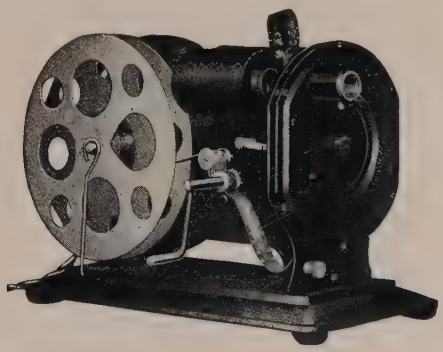


The Kodascope projector, a companion instrument to the Cine-Kodak

The Hall projector is a similar instrument, slightly more elaborate and is furnished to take either the safety standard or standard film. It throws a picture up to four by five feet, amply large enough for home use. It can be placed in a space 7½ x 8½ x 11½ inches. It uses a 12-16 volt lamp, 32 candlepower. The resistance is contained in the extension cord and for use it is only necessary to attach the cord to any light

socket. It is furnished in hand or motor drive, and with either 500 or 1,000 foot reels. It costs seventy-five dollars with 1000 foot reels and twenty-five dollars extra for motor drive.

The Vitalux film, of course, requires the Vitalux projector. This machine is finished in black flake enamel and operates by either hand or motor power. The light is a 110 volt, 250 watt projector bulb with concentrated filament. The socket is adjustable for centering the lamp in the optical axis. The machine with motor weighs twenty-five pounds and measures 7¼ x 12½ x 14¾ inches. It is supplied as a part of the Vitalux outfit.



The Victor-Cine Projector

There are three standard projectors on the market for use with the sixteen millimeter sub-standard film. These are the Kodascope, supplied as a part of the Cine-Kodak outfit, the Victor projector, and the Bell & Howell projector.

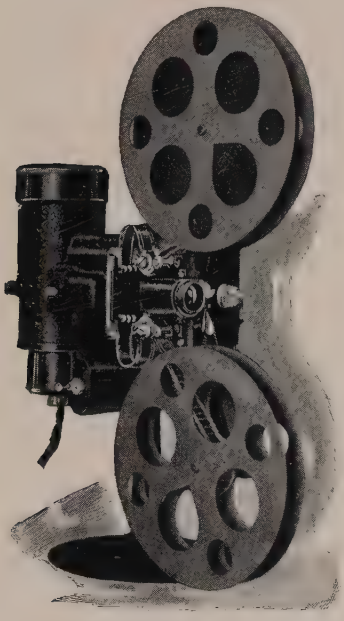
The Kodascope is a beautiful instrument, the mechanism being largely enclosed in a black flake enamel

case, and the whole being very compact. It is furnished with electric drive and has a capacity of 400 feet of film, equivalent to 1,000 feet of standard guage film. A film splicer is incorporated in the projector, or rather I should say, that it is furnished as a part of the projection equipment. The machine is motor driven. It is furnished as a part of the Cine-Kodak outfit and is not sold separately.

The Victor Cine projector also uses the sixteen millimeter film. It is of unusual design in that the two reels lie side by side instead of one above the other as is usual except in suitcase projectors. It is of all metal construction finished in flake black enamel. The condensors are three in number and the lamp house is provided with a silvered spherical mirror behind the lamp. This gives a strong illumination with a comparatively small lamp. The lamp is 32 candlepower of 12 to 16 volts. A resistance is supplied as a part of the projector for use with 32, 104 to 120, 125, 220 or 250 volts. The 104 to 120 volt being supplied when not otherwise specified. The intermittent will operate more than one thousand hours without adjustment, and is easily replaced. It is adjusted at the factory. The ratio is 6:1. The flickerless shutter is adjusted at the factory and is entirely enclosed. The take-up is adjusted at the factory. The machine is furnished in hand drive only, the crank being turned two times per second, just as in using the camera. The projector may be stopped and a single frame projected as a still whenever desired. The spools hold 400 feet of sixteen millimeter

film, although the projector will also take the 100 foot camera spools if desired. A picture 30 x 40 inches will be projected with a throw of sixteen feet.

The Bell & Howell is a very compact projector and as in their camera, this firm has made another step in sub-standard work. This camera is equipped with an



The Bell & Howell Filmo projector, a highly efficient projector for sub-standard film

automatic light stop, and forced air cooling and will meet all underwriters' requirements, especially as the sub-standard film is coated on non-inflammable stock. The motor is not in any sense an attachment, but is built into the body of the machine as an integral part thereof. This projector moves forward or back or

stops for the projection of a single frame. It tilts upon its standard so that it may be used with a screen elevated above the heads of the spectators, or from a balcony, projecting downward. The intermittent is a 9:1 movement and the projected image is flickerless. The image may be projected life size, if desired, instead of being limited to a smaller size, about 30 x 40 as is the case with other sub-standard projectors. When folded this projector measures 6½ x 9½ x 10 inches and weighs nine pounds. It has a capacity of 400 feet of film.

In projecting motion picture film, the first consideration is the length of the room in which the projector is to be used. The size of the image depends upon the distance of the projector from the screen. Thus, a sub-standard projector is listed to throw a 30 x 40 inch picture at a distance of sixteen feet. If the projector is moved nearer the picture will be smaller but brighter. If moved farther away it will be larger but dimmer. So if the projector is listed to throw a 30 x 40 picture at sixteen feet it is presumed that any larger image will be too dim for convenient use. In professional work, lenses of different foci are supplied whereby an image of a given desired size can be obtained with the throw most convenient for the size of the theatre in which it is to be used.

The projector is a machine which must operate rapidly and accurately, but it is built more ruggedly than the camera. It should be kept well oiled at all times, but oil should not be allowed to accumulate, for an oil spot on the film will make a permanent spot.

The machine should also be kept scrupulously clean, and all dirt, dust, film shreds and so forth should be wiped off both before and after using the machine.

Both projecting and condensing lenses should be cleaned with a soft, well-washed linen rag. This should be done every time these lenses show signs of clouding, or show specks. The silvered reflector behind the lamp should be kept polished, but should not be rubbed too much.

When setting up for operation, the projector should be run without film to see that all is in proper working order. Observe the take-up and see that it works properly, see that the motor does not heat up unduly. Then look at the light upon the screen. There may be a shadow on some part of the screen, with colored edges. This shadow may be on one side, all around the margin, or a spot in the center. If it is at one side, move the light sideways, until the shadow disappears or is uniform around the screen. If it is at the top or bottom, move the lamp up or down until it disappears or is uniform. If it is uniform move the lamp back and forth until it disappears. These shadows are caused by the lamp being out of focus or out of alignment with the condensors. When the light and operation are all adjusted, stop the machine and insert the film. This is done in various ways, and the manufacturer's instructions should be followed for this operation.

The film is lead from the retort reel in such a manner that when the film is threaded in the intermittent, the emulsion side of the film is toward the light and the image upside down. If this is done, the picture will

appear right side up, and the right and left directions will be correct.

If the film breaks, stop the machine, remove the film and pull out about a foot, rethread, fasten the two ends with a small paper clip, taking care that the clip is inserted inside the magazine, so that it will not have to pass through the throat of the magazine. The film can then be patched at some later time.

When the film has been projected, it must be rewound before it can be projected again. In most projectors it is wound so that the emulsion side is out, and this will lead the film from the top of the retort reel in a straight line into the gate, with the emulsion side toward the light as is proper.

The patching is done just as is explained under the heading "Editing." If any perforations are torn out, this torn place should be carefully trimmed as shown in the illustration on page 170. This will make the film ride smoothly through the intermittent, preventing any further tear, which would occur if the torn perforations were neglected.

If the film is torn, it should be cut in two and patched, the number of frames taken out depending upon the size and shape of the tear. This is illustrated in the accompanying print from a strip of film more plainly than can be described. It is necessary to remove all of the torn portion and to cut the film so that it will match in patching.

If the film should ignite, do not try to extinguish the flame with water. The best thing to do is to throw a blanket or other heavy fabric over the entire machine to exclude all air. If the magazines ignite, there is

danger of such a sudden blaze that it is often spoken of as an explosion.

In using new film, the film will often seem to catch momentarily in the gate causing the latter to "chatter." When this occurs stop the machine and remove the film from the gate. A black, waxy substance will be found upon the film rails and this must be removed. Do not scrape the rails with any steel or iron instrument. Operators in theatres usually use a coin, the softer metal removing the accretion of gelatin without scratching the rails. If these are scratched, as would be the case if a steel knife were used to remove the gelatin, these scratches would serve to catch it more easily and soon the rails would become so rough that perfect projection would be impossible.

By following these instructions, supplemented by the instructions furnished by the manufacturer of the machine you use you should have no trouble with projection. Projection, as performed in the home, is little more than the intelligent operation of a machine. There is none of the highly specialized technical knowledge required which is required in making the picture or in finishing it. Projection is easily learned by anyone, but I maintain that only the artist will ever make really good photo-plays. However, as all photographic amateurs have more or less artistic sense, these should have no great trouble in cinematography.

If you want to get the most out of cinematography, make the picture yourself, but let Johnny or Mary project it while you watch. The kiddies will keenly enjoy operating a real "movie" machine, and such operation is entirely within the scope of their capability.

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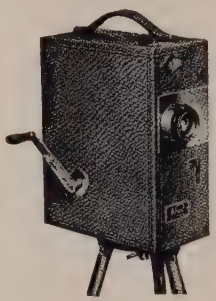

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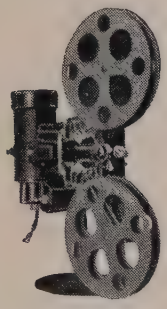

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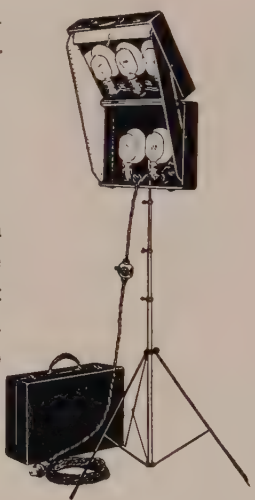

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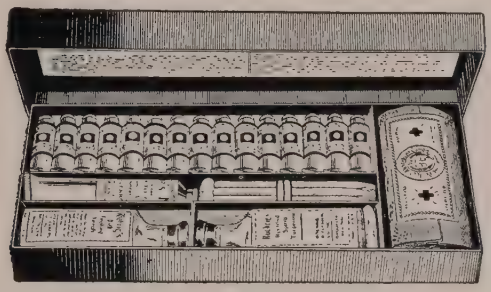

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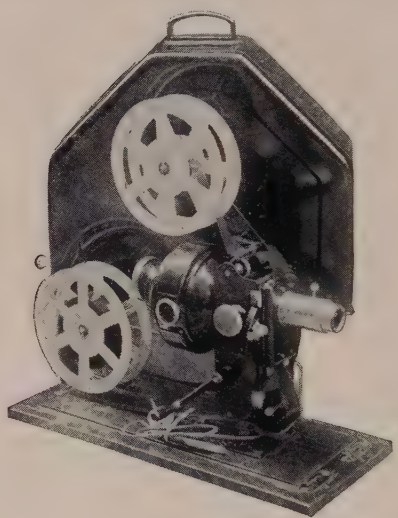

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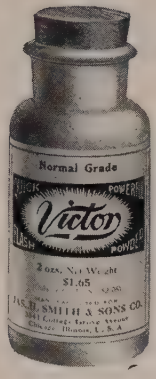

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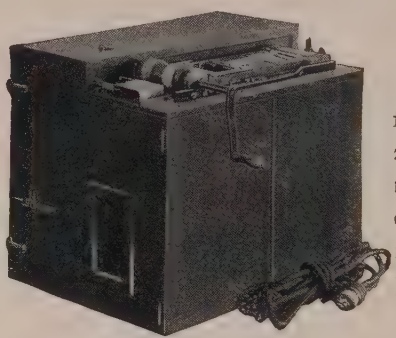

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